MAN-MADE FORESTS

S. KONDAS

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Cover : Sprouting shoots of conical shape from the stools of Eucalyptus plantation recently felled.

Frontispiece : Wattle blossom.

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INTRODUCTION

THE NEED for presenting this book "Man-Made Forests" is obvious because the subject is an ever-interesting one and offers challenges in the proper and useful exploitation of our natural resources.

Many vital industries in India are dependent directly or indirectly on our forests. Either the raw produce or finished products from our forest enhances the standard of living of our countrymen particularly by way of earning valuable foreign exchange. In fact, but for our forest wealth, life in this country would have been more difficult. Our Governments, both at the Centre and in States, are aware of this and spare no effort in the proper exploitation of our forest wealth. This includes for example reforestation and preservation of the balance in nature and phased harvest of the available resources.

This book written by Shri S. Kondas amply deals with the subject precisely and at the same time briefly. It brings home the various important aspects of the forests and its utilization in an elegant and interesting manner. Shri Kondas is a distinguished District Forest Officer of the Tamil Nadu Forest Service. He has undertaken to present his rich experience, knowledge and know-how in a lucid manner. He has rendered his thoughts with remarkable clarity in style and expression that will not fail to be appreciated by young and old. Though this book is intended for the young student at school, I feel quite certain it will attract the interest and attention of elders alike to get a glimpse into this important aspect of our country's wealth.

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PREFACE

LONG LONG ago the world was a quiet place of mountains, rivers, trees, binds, beasts. Man was not man as yet. Nature was reigning supreme. He lived a life by her kindly law. Nature made him what he was.

Times have changed and so has man. Man of today needs many things. He turns to Nature not as a child would do to its mother but as a worthy partner. He sets out to tame her vast resources. Forests are one of them and how he taps her wealth is, in short, the theme of this book.

Children could be voracious readers provided the stuff is to their taste. They do a lot of reading in a moving train, in a crowded bus or in the classroom stealthily. What makes these books so absorbing? Probably the theme falls within the realm of their understanding and imagination. The manner of story telling is gripping and stories are full of sensation, suspense and mystery. Further they are highly readable which makes reading so enjoyable.

I have attempted to model this little book on some such lines. Fortunately, I have no syllabus to restrict my freedom. I could pick and choose out of a wealth of material which, to my mind, will appeal to the child. No jargon is allowed to come in the way of free and easy reading. Points of historical, scientific and social significance are introduced. This, I hope, will sustain the interest of the reader. Now I leave it to the reader particularly the child itself who is the real touchstone to judge.

After completing the text I went on a photography tour accompanied by our staff photographer, M. Ravikumar. We shot pictures to meet the exact needs of the text. It was extremely time consuming and at times gruelling as the right object often eluded us. Despite this, the photographer made a splendid job as is seen from his vivid and sharp pictures, which, no doubt, gives a touch of completeness to this book. My thanks are due to him. I have also included five photographs for which acknowledgement is made.

I am grateful to Shri K.A. Bhoja Shetty, I.F.S., Chief Conservator of Forests, Tamil Nadu, who accorded me permission to undertake this tour without which production of this book was well nigh impossible.

I thank profusely Prof. T.S. Sadasivan, Chairman of the Study Group on Biology, National Council of Educational Research and Training for the opportunity he has given me to address the children on a theme which is not only of academic interest but also of national importance.

S. KONDAS

Palayamkottai

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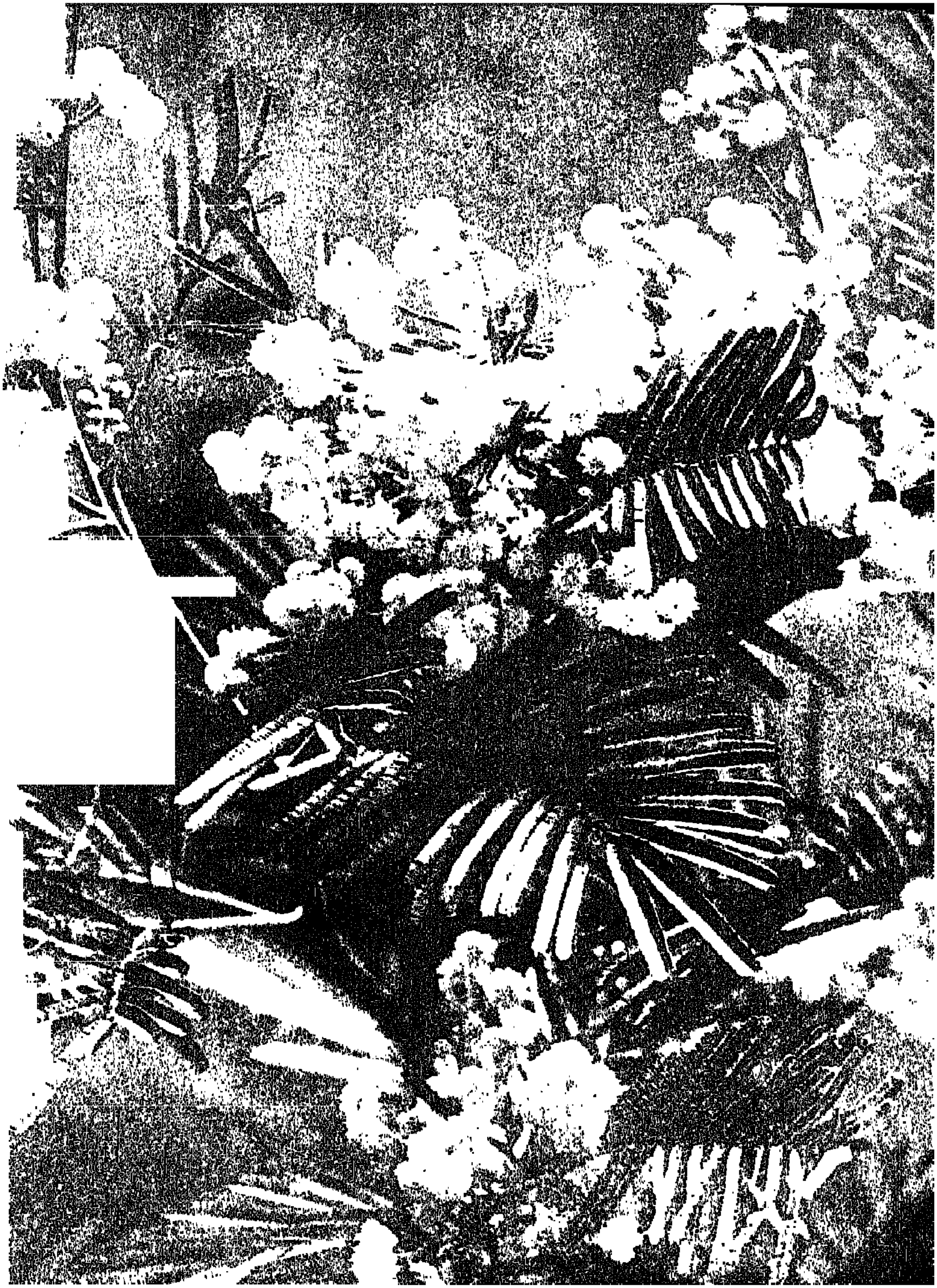

1

IN PRAISE OF WOOD

Wood and the savage

WHEN MAN was a savage, a long time ago, he was roaming in the jungle like any other animal. He was gathering berries and digging up tubers whenever he was hungry. His dwellings were rough and crude and were made of boughs, leaves and fibres. One day he saw something strange and frightening. It was the first time that he saw such a thing. A fierce fire was raging in the forest. There was thick smoke with a crackling noise. The neighbourhood was unbearably hot. Late in the day when the fire had died down the shocked savage saw the charred remains of trees. In the ashes there were some tubers which had got roasted in the fire. He found that they tasted better after a while in fire. He learned to make fire to warm himself and to scare away wild animals. When he chanced to taste flesh of animals he started hunting them. Sticks and clubs were his tools which he threw at them. But they were no good for fleet-footed animals. Sturdy bows and arrows were then fashioned and with them he shot them down. Some day a heavy rain swept away his home. Many things were washed away. Many trees which were uprooted came floating down the swollen river. The savage saw that trees could float and things made out of them could take him across rivers and streams.

The savage slowly understood his place. He started learning more and more of what soil, seasons, plants and animals meant to him. Tired of a wandering life he longed to stay and live at one place. He started

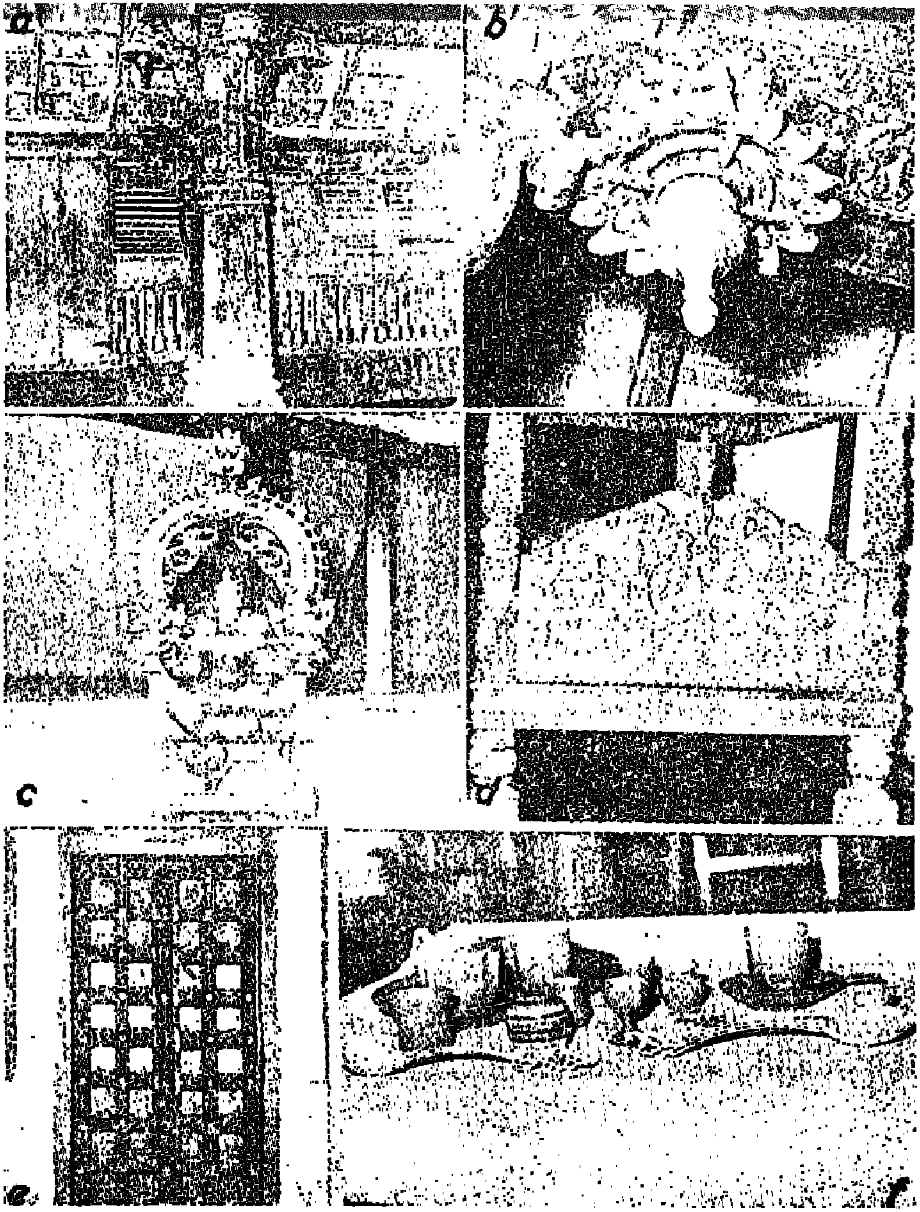

Fig. 1 (a) Wood carved pillar, ceiling and wall. (b) Intricately carved design of pillar. (c) Idol in wood. (d) Finely designed wooden bedstead. (e) Door (f) Wooden tea set.

growing some kind of grain and tubers. He broke the hard ground and made it fit for his crops. What he used as a plough was a simple sharpened stake. His simple tools, the bow, the arrow, the plough and his dwelling were made of wood. Wood gave him the warmth he needed on a cold night. Next to food it was wood that the savage wanted most.

Man and wood

Hundreds of years rolled by. No longer did he remain the same savage. His ways of living and habits changed. His wants became many. Wood, his oldest companion, came into use in a thousand ways and forms in his daily life. It has now become the material for making household articles and furniture. And wood came to stay with man. It is the foremost building material. Even an entire building could be made of timber including its walls, floor and roof. (Figs. 1a to f, 2 and 3). It is lavishly

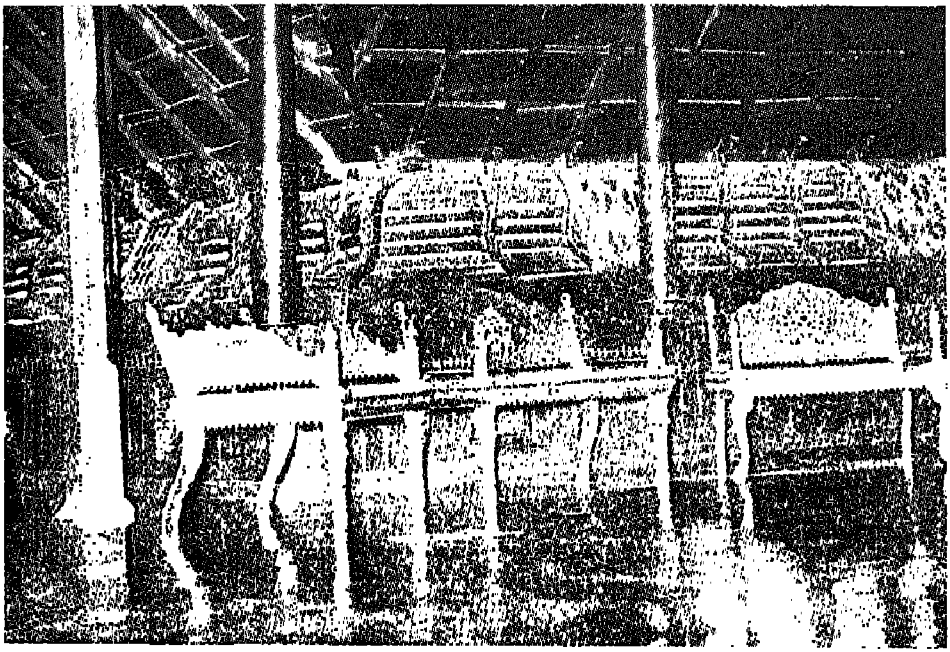

Fig. 2. Court Hall. All made of wood-beams, pillars, ceiling, roof, windows and furniture.

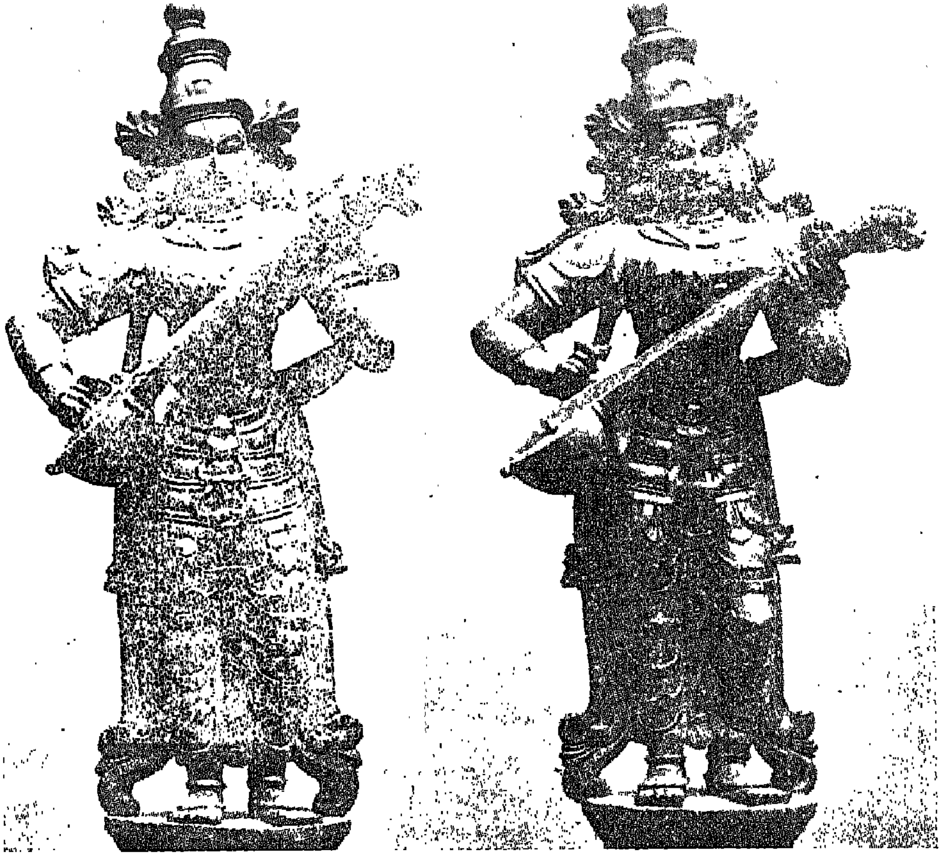

Fig. 3. Pieces of exquisite carving—Celestial Nymphs.

used to beautify the interior of public buildings, monasteries and churches. Farm tools are made in a great number. Carts and wheeled carriages use wood. Rail roads and bridges cannot do without it. Ships, big and small, for trade and war, are made with wood. Mines are worked. For pastime, a variety of sports goods, toys and musical instruments are invented.

In the long story of Mankind there is a Stone Age, a Bronze Age, a Steel Age, and an Atomic Age. But there is none called a Wood Age. Why? Wood is very much with Man like air and water and perhaps the story of Man is the story of Wood itself.

2

WHAT IS WOOD LIKE ?

Hardwoods and softwoods

TREES ARE grouped into hardwoods and softwoods. Hardwoods include common trees like sal, teak, shisham, eucalypts, etc., having distinctly broad leaves. More than nine-tenths of our forests are of this kind. The wood is generally hard and heavy. Softwoods mean conifers like deodar, pine, etc., bearing needle-shaped leaves in clusters. They have soft and light wood. They grow mostly on the Himalayas. There are some broad-leaved trees like semal which are not hard. They are also called softwood but they are different from conifers.

Why do trees produce wood ?

Trees produce wood not because it is useful to us but because they need it in order to be strong and firm. The trunk stands like a pillar of great strength bearing aloft the heavy dome of branches and foliae. At the same time it remains flexible and yields to strong winds.

What is wood like ?

If we know what wood is really like we can choose the most suitable wood. Take a small block of wood and get a slice as thin as paper. See it under a lens. A curious honeycomb pattern appears (Figs. 4 a, b). Each one of the 'chambers' is called a cell. As we make houses with bricks, Nature builds trees with billions of cells. There are many kinds of cells. The commonest in the wood is the fibre-cell. They are like fine minute tubes, half a mm to five mm long, and closed at both ends. Their ends are usually tapering but may be blunt also. They are made of a white substance called cellulose. But wood is brown because the fibres are coated with another substance known as lignin. Lignin makes the fibres stiff and binds them into a tight bundle so that trunk and branches can remain strong.

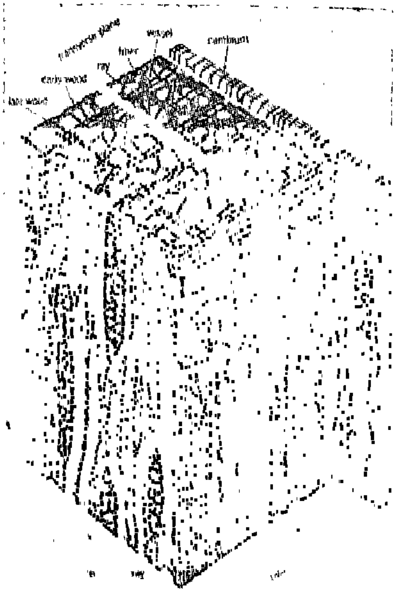

Fig. 4a. Wood structure in 3-dimension.

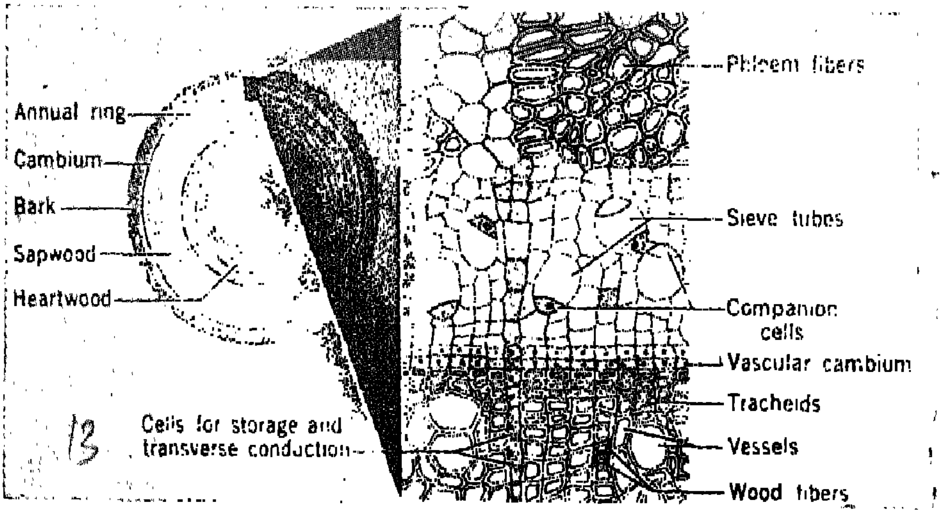

Fig. 4b. Wood structure in cross-section,

What makes timber so different ?

Some timbers are stronger and heavier than others. Some are tough and hard. Some are easy to shape while others are not so. Some are excellent for carving. Some make paper better than others. All are wood. What makes all this difference ? It is the fibres. They are different in size and qualities and different in packing in different timbers.

Wood is good

Wood has many desirable qualities which are suitable for making a variety of things. It is strong and yet light and so commonly used as beams, posts in buildings and bridges. It withstands rough and hard use and bad weather and so is used for ship deckings and rail road sleepers. It is tough and elastic. Axe handles, cricket bats stand repeated blows very well without splitting or paining the hands much. Wood is wonderfully flexible. It springs back after bending. That is why fishing rods and diving boards are made of wood. Wooden boxes and frames can be made easily by nailing pieces together. It is easy to work on wood. It takes good polish. Finally it is a good fuel and is cheap to get and use.

3

WOOD TODAY

FOR AGES man used wood as it came from forests. He took it as a block or a piece of material and shaped it to his needs. He had many things made of wood. Today it is a wonder material in the hands of the scientist and the technologist. It is amazing that things never imagined before are now made of wood such as paper, plywood, building-boards, plastics, rayon and so on. The discovery of wood is fascinating and absorbing and presently you are going to read some of them.

Paper

Even four thousand years ago the Egyptians knew how to make sheets out of reeds for purposes of writing. They called the reed papyrus and it is from this name that the word *paper* comes. Two thousand years later in China paper was made out of rags. The Arabs learnt it and from them it spread to Europe and later to the New World.

To know what paper is like gently scratch a piece of blotter by a needle. You will find that it is a mesh of fluffy fibres pressed into sheet. So all that is needed for paper manufacture is long fibres that will mat all right.

Hand-made paper

In the past flax, linen and cotton rags were used. Pulp was prepared by pounding the rags in water. The worker took the pulp in a large sieve-like vessel, jerked and twisted it in such a manner that it spread evenly. As water drained out, the fibres stuck to one another strongly. A thin white felt was formed. It was removed, pressed and dried. In those days there were not enough of rags and so paper was scarce and costly.

An important discovery

In the middle of the last century an important discovery was made. It was that paper could be made out of wood. Wood is plentyful, cheap and much of it is fibre. Once paper became cheap, mass education started all over the world. More than nine-tenths of the paper produced in the world today comes from wood.

For making paper, wood or bamboo is chipped into small pieces and cooked in certain chemicals. This is to separate the fibres and dissolve other wood (Fig. 5) substances. The wet fibre-mass is called pulp.

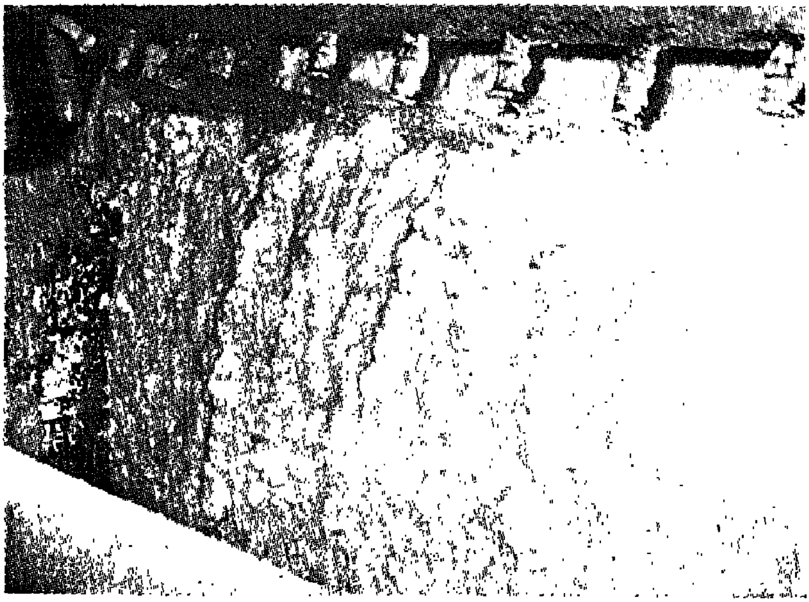

Fig. 5. Soft wet fibre-mass called pulp is being washed before made into paper.

The pulp is brushed in water in a machine called beater so that they will mat together well and be strong. Some chemicals are added to give stiffness and smooth surface. The watery pulp passes through a series of machines before becoming paper.

In India the first paper mill was installed in 1870. Now there are nearly 30 mills scattered all over the country, the largest number being in Maharashtra and Bengal. While other countries use wood, we make paper mostly from bamboos. Sabai grass and reeds are other materials. Nepa Mills in Madhya Pradesh, the only newsprint factory in India, uses salai wood. But salai does not make good pulp. So it is mixed with bamboo pulp. There is not enough bamboo for all the paper we want to make. Many of our broad-leaved trees have short length fibres. They are not very good for paper. However, in future pulp from wattle, eucalypts will also be used by mixing with bamboo pulp.

Plywood

The term plywood means wood in sheets. It is light and does not warp. It is many times stronger than a solid plank of the same thickness. Softwood trees are favoured for plywood manufacture. Logs are made soft by first boiling in large tanks for some hours. Then the log is peeled into thin long sheet called veneer by rotating it against a sharp knife. The veneers are cut to sizes and glued together crosswise into three, five or many layered sheets.

Plywood in the Second World War

For a long time plywood was used only for the interior of houses. It evoked great interest during the Second World War. Wings and fuselage of aeroplanes were made of superior plywood. During the war England was raided by a squadron of Italian planes built mostly of wood. England answered the challenge by its bomber and fighter, Mosquito—an all wood plane. No German fighter could match it.

There are nearly 70 plywood factories in our country. They were started mainly to supply tea-chests. Most of them are in Bengal, Assam and Kerala where there are extensive tea gardens. Other kinds of plywood for boat building, aeroplanes and for other general purposes are also made. Some varieties of beautiful wood like teak, rosewood, walnut, mahogany, etc., are very valuable and scarce. It is cut into thin veneers and glued to the common or cheap wood. Furniture, cabinets, doors so made appear as if they are built of solid valuable wood. These veneers are called decorative plywood.

Building-boards

For plywood manufacture wood of special quality is needed. Logs should be big, straight without knots or defects. Even then only half of it becomes plywood and the rest goes as waste. The wood-waste from plywood factories and saw mills, branch wood left in the forests, and firewood of any kind are made use of in an astonishing way. They are shredded into bits and reformed by gluing them into boards of many kinds—chip board, particle board, fibre-board, hardboard, etc. There are at present a few factories; one in Maharashtra, one in Kerala, one in Mysore. They will be serious rivals to plywood in future.

Safety matches are an article of daily use. The first match factory was started in 1922. Now there are 225 factories distributed throughout the country. Besides, there are many small cottage factories in Ramnad district of Tamil Nadu. We make more than 60 million gross boxes of matches every year. This may give you an idea of the enormous quantity of wood needed.

Rayon

Modern chemistry has discovered a method of turning wood into a series of materials never imagined before, such as cellophane, photographic film, plastics and artificial silk called rayon (Figs. 6 and 7). The

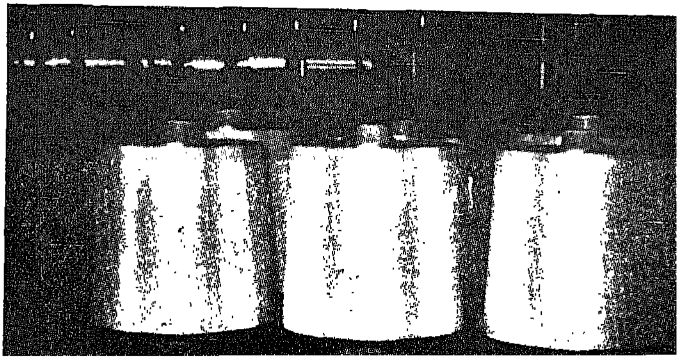

Fig. 6. Rayon fibres spun into yarns for weaving.

last one is the most important. A hectare of plantation gives nearly five to ten times the fibres that a hectare of cotton can give. In the factory wood cellulose is turned into a brown substance, thick like syrup, called *viscose*. This is spun into fine rayon filaments. They are washed, dyed and woven into elegant hardy fabrics. There is already a factory in Tamil Nadu and another in Madhya Pradesh.

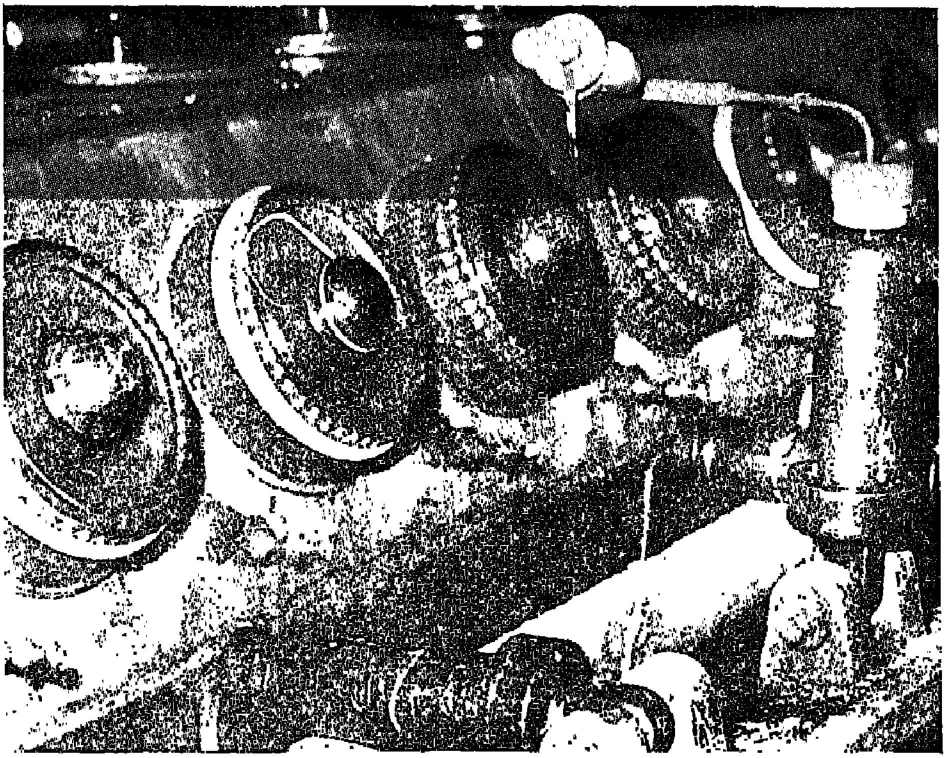

Fig. 7. A spinnert lifted out of acid bath to show viscose coming out as treacle. Viscose is turned into fine rayon filaments.

There are many wood-based industries like sports goods, furniture, pencils, toys, bobbins, shoe-lasts, etc., which need more and more wood of the right kind. A large quantity of wood is got from natural forests. A good quantity is obtained from man-made forests about which you will read in the next chapter.

4

MAN-MADE FORESTS

How man-made forests were created?

IN THE whole of Northern Russia, Sweden and Norway there are less than a dozen kinds of trees. In the U.S.A. the number is nearly eight hundred. In our country there are about 2500 kinds of trees growing in the forests. But we can count on our finger tips the kind of trees which will make good timber or grow fast and produce enough wood for the manufacture of paper, plywood, building-boards, rayon, chemicals and for firewood. Except sal and chirpine which grow in large groups themselves useful trees grow mixed with other kinds naturally. Man started growing them in compact blocks in suitable places. It is better that way because it is easy and cheap to grow, protect and harvest. These man-made forests are called plantations. They are 'factories' where wood is produced to meet our innumerable wants—a kind of partnership between Man and Nature. Plantations are grown to meet our customary needs for buildings, furniture, tools and firewood, etc. Extensive plantations are raised to meet the demands of factories making paper, plywoods, building-boards, match splints and rayon. To this long list can be added plantation for resin, tan-bark, rubber, cashewnut, etc.

Getting to know the trees and the place

For growing a plantation we should know all about the trees and the places they are likely to flourish. Plants like us, have strong likes and dislikes. Some kinds of trees need deep, well-watered, fertile soil while others come up even under poor conditions. Some trees grow only when the ground is heavily shaded. A few need lot of light even when they are young and tender. There are others which grow under shade to start with but need light later.

When we plan for large plantations it may be difficult to choose a big block of good land. Flat ground is easy. Hilly ground is uneven and difficult. Soil is not uniformly good, it is deep in valleys and not so deep higher up the slopes. There may be marshes and pockets of heavy soils. We should avoid hollows which are warm in the day and terribly cold in the night. It may be easy at one place and very difficult only a few metres away. A well chosen land will have very little of unsuitable patches. We should know the rainy season, the right time to plant, the severe winter and the windy season of the place.

Growing a plantation

The simplest way to grow a plantation is to sow seeds where we want the trees to grow. This is what the farmer does. He ploughs his fields before sowing. Ploughing is not always possible in forests. Nature does nothing of that sort. The ground under trees remains soft, as good as the field, for the seeds to germinate. The forester copies Nature and the farmer. He gets ready with his land by grubbing or turning the sod at spots where he wants to raise his plants.

If the ground is prepared like the farmer's field we can sow seeds all over. But it is good to sow them in lines, better still to sow in spots regularly spaced. It is easy to grow plantations that way.

No doubt, sowing is easy and simple. But it is not the best way of raising a plantation. Often there are too many for room and food. A large number of them die or do not grow all right. Such a plantation will be uneven in growth.

Nursery

There is a surer way of doing this kind of work. For that we must have a nursery. It is called nursery because we nurse the seedlings with love and care. A small good place near the future plantation is chosen. All forest growth is cleared and the ground levelled. Seed beds are formed by using only the very good things like vegetable mould, loam. Seeds are sown and watered every day. Soon tiny seedlings appear. Watering is done gently by a rose to prevent damage. The tender seedlings are sheltered against sun and harsh winds. Insects and fungi are their enemies and care is taken to keep them away.

Time comes when we have to think about the future of the seedlings. Life in the forest is going to be hard indeed. Plants having easy life all along in the nursery may suffer and even die. In the last few weeks we train them for their future struggle in life. Gradually watering is rationed and shelters are removed. Plants slowly get used to forest-like conditions. This makes them hardy and helps them to succeed when planted out. The time plants spend in the nursery varies with the need. Some remain for a few months while others for a year or even more.

There is another method of preparing them. After a few weeks, when they are still tiny, the seedlings are gently pulled off the beds and put in pots or bags. No doubt the seedlings suffer, but they repair their injured roots soon and start growing. Each one has a pot of soil to itself and so grows better.

Suppose there is a forest already where we want to grow a plantation. The first step would be to have the trees and bushes cleared. All trees are felled. After removing the useful logs there will be still unwanted logs and lot of brushwood lying about scattered. If they are not removed a fire may break out in summer, killing the plants. Further they will hinder the planting work. So the area is set on fire and burnt over for getting rid of the unwanted material. After the fire the entire land looks bare and brown. The next step is to mark the planting spots on the ground in order to space the plants. Some kinds are closely spaced and some are widely planted. Most of the plantations are raised with nursery seedlings. The forester is busy as the rainy reason approaches. After a few good soaking showers when the soil is moist, planting is done.

Choking weeds

Our plants grow up and along with them appear some unwanted ones. They are called weeds. If they are not removed in time they grow fast and choke up the plants. In order to give our plants the best chance to live and grow, weeds are removed. This is done over and over in the first few years.

Training through struggle

We start forest plantations with a large number of plants. In a few years there is crowding. This means that all trees have not enough room. A good plantation always has enough good trees, not too many, not too few. The exeess trees should go. Those promising to become good trees will remain. The rest of them, poor, crippled, diseased are removed. The forester calls the removal by the name *thinning*. The plantations need a few thinnings and every time the poorer ones are removed.

When we start a plantation, say of teak, we have 2500 plants in a hectare. After all the thinnings are over about 80 trees remain. You may wonder why we should start with so many to have so few at the end. Orchards are not grown in this way. There are good reasons. When we grow them in a crowd each tree struggles for enough room and food. They grow taller and taller to catch sunlight and grow straight. Their lower branches remain heavily shaded. They starve and wither away while they are still young and thin leaving the trunk clean of limbs for many metres. This is how trees are tamed in the first few years in plantation. Only such trees produce timber of good quality. Compare the trees growing in the open with the plantation-born trees. They are short, very branchy and knotty and of little value for timber.

There are other ways of raising plantations without doing the planting. You will find them in the chapter on Sal and Eucalyptus.

5

TEAK, THE CHOICE OF SHIP BUILDERS

Teak and Alexander, the Great

THE BLOODY battle between Alexander, the Great and the Indian king Porus was over. Alexander had won. He had plans to march forward. But his troops were most unwilling. They had been away from their homes for more than seven years. They were homesick and tired of fighting. Alexander was compelled to return. He built a fleet of 2,000 ships and sent his tired men back from the mouth of the Indus to the Persion Gulf. The ships which he built were made of teak wood.

Teak and the English

Englishmen came to our country as traders to sell their goods and to buy ours. They settled down in a few coastal towns like Surat, Bombay, Calcutta and Madras. They had some ships for trade. Frenchmen too entered our country for the same purpose. There used to be fights between the English and the French, and the local kings. Englishmen knew about ships more than anyone else. They saw that a good fleet would help them in war and trade.

They had a dockyard at Bombay for building and repairing ships. They looked for a suitable timber for building ships. Teak growing in Kanara and Malabar forests met their wants. A large warship called

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TEAK : *Sagum,* Hindi; *Sagwam,* Marathi; *Tegu, Tegina,* Kanarese; *Teku;* Telugu; *Thekku,* Tamil, Malayalam.

"Drake" of 14 guns was built in 1736. It was the first to be launched. The ship builders in England came to know of teak and found it as the world's best wood, even superior to their oak. Plans were made for building more ships. Countless trees were felled. The Bombay dockyard was busy, and ships were launched one by one. In 1805, a fast moving ship of 36 guns for the navy of King George III was built entirely of teak. This went on until the builders began to worry about one thing. They wondered if there was enough teak for ships in future.

First teak plantation

There was a Collector of Malabar by name H.V. Conolly. He was a thoughtful man. He feared that there would be no teak in the forests after some time. He made a quick guess work. To build a ship those days 2,000 mature trees were needed. He thought that it would take teak sixty years to grow to that size. On the 61st year trees planted first could be cut and next year those planted in the second year and so on.

No one knew how to grow teak those days. Conolly was not a trained forester either. But he had the forester's bent of mind. He tried to sprout the seeds and to grow them in forests. He did not succeed for three years. Finally a clerk of his office found out a method. The Governor of Madras also was interested. He gave the Collector the services of a local forester, Chathu Menon. He helped Conolly and the first teak plantation in India was raised in 1844 near a small forest village, Nilambur, in Kerala. Chathu Menon continued his excellent work for 18 long years and raised nearly 600 hectares of good plantations. There were many difficulties but he was not discouraged. His work was highly praised and he was presented with an ornamental woodman's knife and belt. On retirement he was granted an honorary pension.

Conolly was a man of rare foresight. He spared no efforts to get what he wanted. In his memory a part of the 1846 plantation on a river bank is preserved today. If you go to Nilambur please do visit the plantation (Figs. 8 a & b). The grand old trees of 125 years are awe inspiring. They stand like gigantic columns, chanting praises of these pioneers.

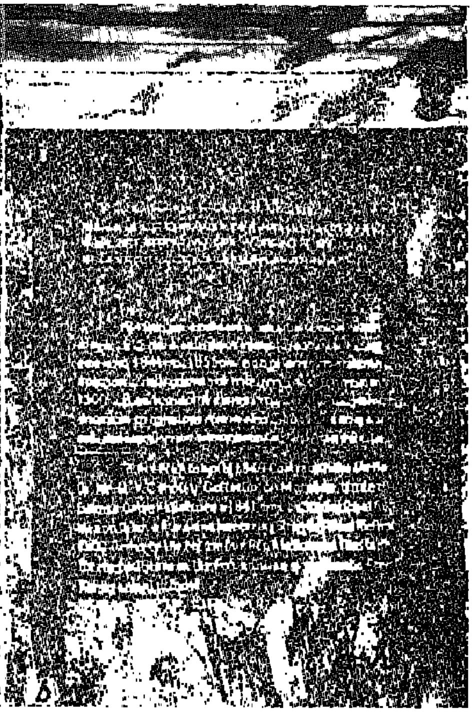


Fig. 8a. Conolly teak plantation raised in 1846 on the bank of Chaliyar river, Nilambur.

Fig. 8b. Notice Board at the entrance of the Conolly plantation.

The great success at Nilambur encouraged others to grow teak for the first time in Burma in 1856, in Travancore in 1866 and in Coorg in 1868. With the fascinating tale of teak began the history of scientific forestry in our country. Since then the forest is looked upon as something living, not very different from us, asking for a little understanding and proper care. Wisely used it gives us in return wood of our choice for ever. If not, man loses his oldest and staunchest ally however bountiful it may appear to be.

Teak forests and plantations

Teak is a native of India, Burma, Thailand, Java and Malaya. In

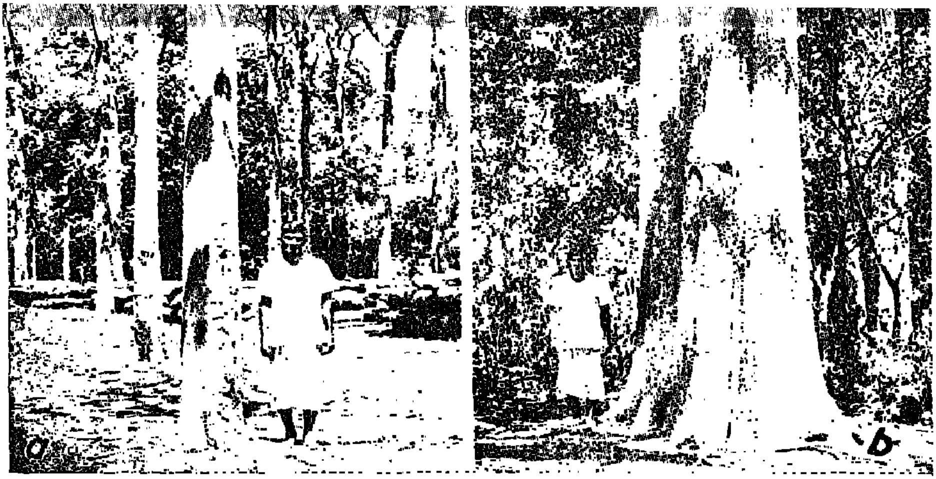
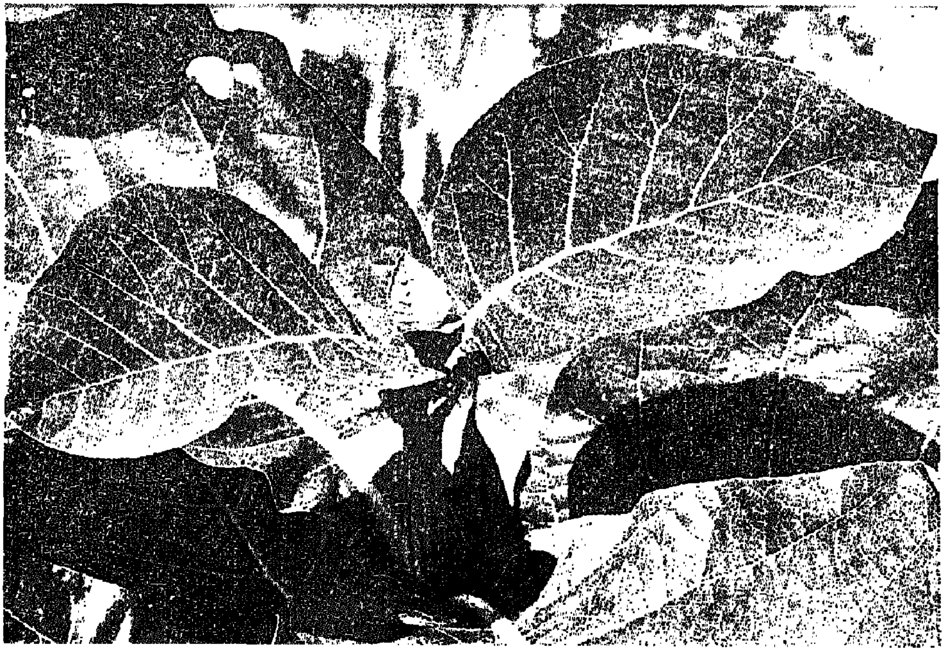


Fig. 9a. 40 year old plantation teak 47 cm in diameter.
9b. 125 year old plantation teak 131cm, the same man appears by the side of trees in both *a* and *b* for comparison.

India it grows in the deciduous forests. Half of our teak forests are in Madhya Pradesh. The other important states are Rajasthan, Gujarat, Maharashtra, Mysore, Andhra Pradesh, Kerala and Tamil Nadu. Teak grows to lofty sizes on the West Coast particularly in Kerala. (Figs. 9 a,b & 10).

Fig. 10. Young teak plant with tender leaves.



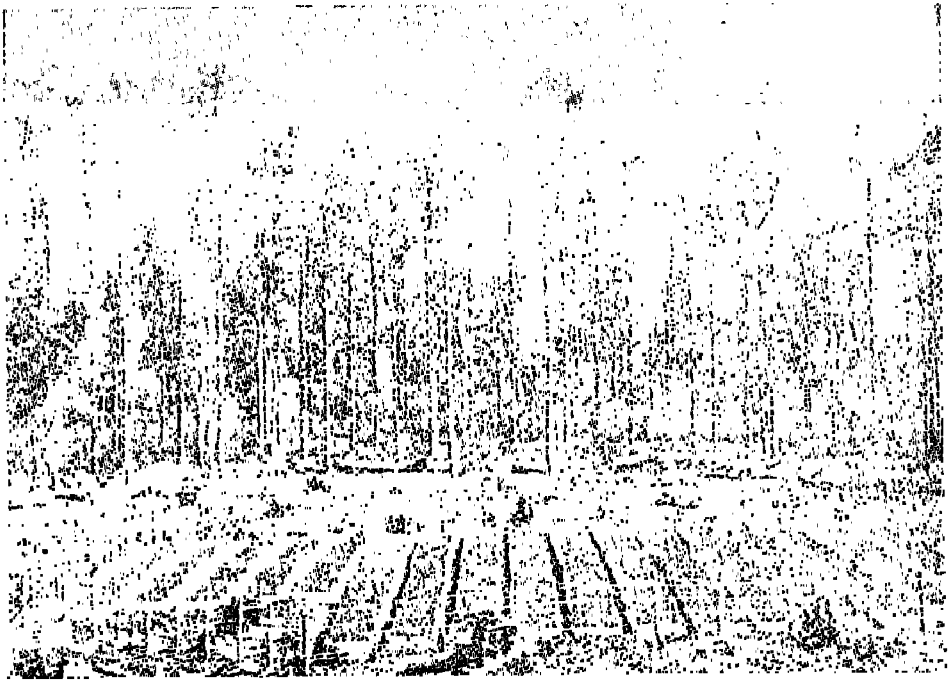


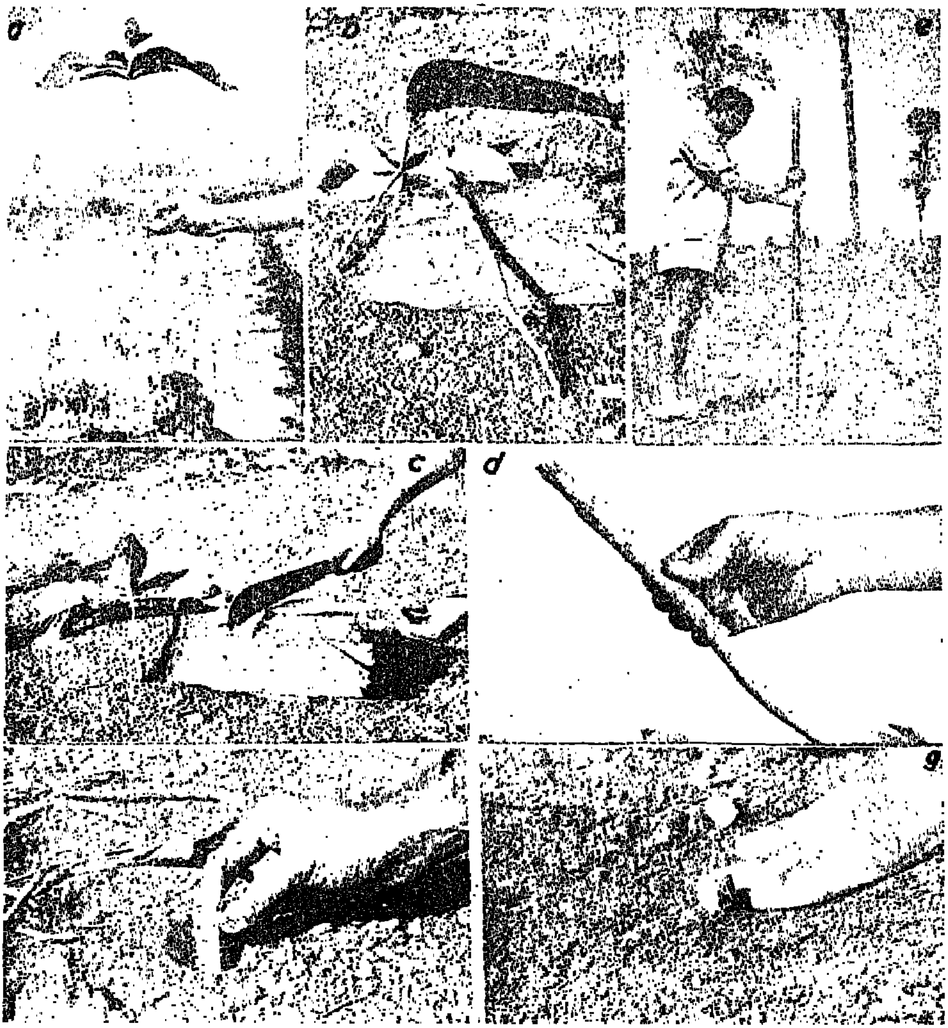
Fig. 11a. Teak nursery beds ready for sowing. Old teak plantation in the background. Teak logs are lying inside the plantation.

In the olden days no definite method of raising a plantation was known. Teak seeds were just sown in the forest and the rest was left to nature. Very few trees came up here and there. The forester expected to get more trees by an improved method. He selected patches of good soil, collected a lot of brushwood and burnt it. The ash was spread over the patches and seeds sown. This method succeeded but there were other difficulties.

The modern method is to plant stumps. The stumps look like long cigars (Fig. 11d) and this is how they are prepared. One year old seedling is taken and by two cuts a piece with 25cm of root and 2cm of shoot is got from each. Thousands of stumps are prepared on the day of planting.

Pits are not needed. Instead holes are made by crowbar 2m apart. One stump is put in each hole and the soft moist ground is properly tamped (Figs. 11b (a) to (g). After a few days minute leaves sprout on the

Fig. 11b. (a) One year old teak seedling pulled out of bed. The portion below where it is held is root and the rest shoot. (b) By one cut the entire shoot except 2cm in length is severed. (c) Another cut trims the root 25 cm long. (d) Fully prepared stump. All side roots have been removed. (e) Hole is being made by crowbar for planting. (f) Stump is inserted in the hole. (g) Soil is tamped around the stump with the top left projecting.



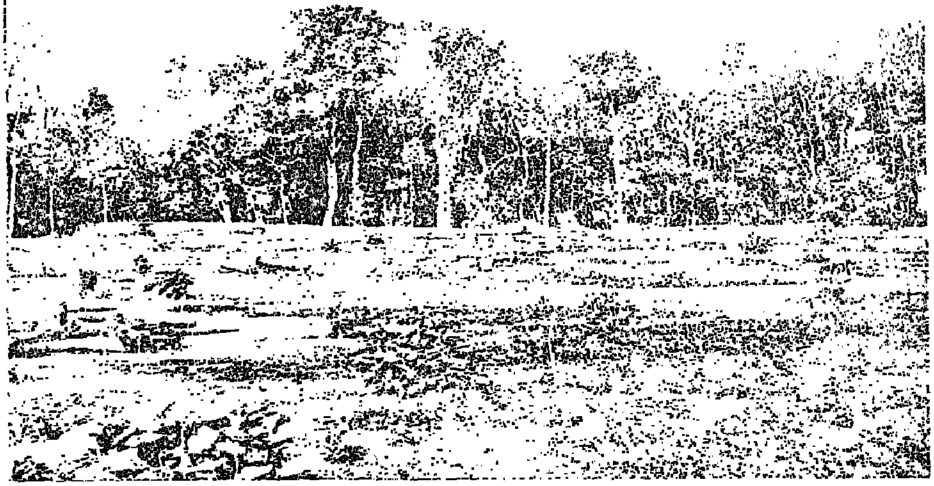
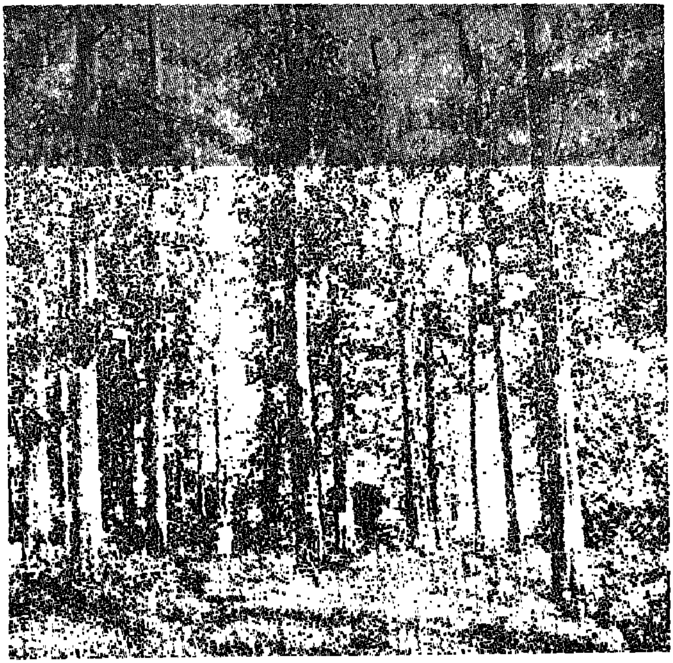


Fig. 12. This is how it looks before planting. Trees are felled and removed and unwanted logs burnt (still a few logs lying) and the planting spots marked by stakes.

top and very soon they grow to a man's height (Fig. 12). The plantation is kept free from weeds for two or three years. It is thinned a few times. When it grows for eighty years for so it is ready for harvesting (Fig. 13).



(b)

Fig. 13. Old teak plantation. Trees stand like lofty pillars and their trunks are branchless for many metres. (*Courtesy* M. V. Laurie)

Versatile teak

The teak has many good qualities. It is strong and at the same time not heavy. It is one of the most durable timbers of the world. White ant and fungi do not spoil it. It lasts long under water. Things made of teak wood remain in the same shape. No wonder it is highly favoured for ship building-deck, masts and internal fittings. With the coming of steel ships it is still used for many things except hull. The wood of a pleasing golden yellow or brown colour with beautiful veins. It is highly prized for making decorative plywood. It is easy for the carpenter to work. It takes good polish. It is an ideal wood for furniture. Any part of a house can be made of teak. In Burma, teak is so plentiful that floorings and roofing tiles are also made of teak. Even some streets in Rangoon are paved with blocks of teak wood.

Teak beams remain sound for a long time. There is one in a fort at Shendwa in the old Holkar State over 700 years old.

Beautiful carvings of teak in pagodas and monastries are very common in Burma. Teak is used in heavy constructions like bridges, piles. It is commonly used for making carts, railway carriages. During the First World War it was used for constructing bridges, rifle boxes and ammunition boxes.

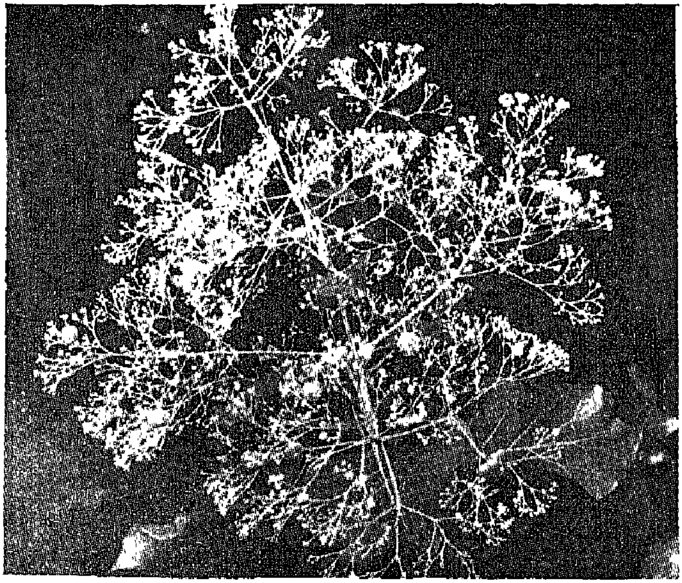


Fig. 14, Teak flower cluster

6

GRAND OLD SAL

SAL IS an important lofty tree of the forests of North India. It grows 20 to 25m high, sometimes reaching 40m in deep rich valleys. Sal grows in two extensive forests, south and north of the Ganga-Brahmaputra plains. Nearly four-fifths of it is distributed in Madhya Pradesh, Orissa and Bihar and the rest is in Uttar Pradesh, West Bengal and Assam along the foothills of the Himalayas.

Sal forests

If you ever pass through a sal forest you see sal and sal all over. It grows over large areas all by itself. There are very few trees of other kinds. Anything that happens to sal forests is at once striking. They are beautiful to look at round the year. In winter the entire forest turns golden yellow as the old leaves start falling. When new leaves appear the whole forest becomes shiningly reddish and then slowly turns to a delicate green. It is a feast to the eyes when it is in flowers. The entire forest goes gay and white from end to end. Just when the monsoon breaks fruits in hundreds come down gracefully spinning on their delicate

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SAL : *Sal,* Hindi; *Shal,* Bengali; *Salwa, Soringhi,* Oriya; *Gungal,* Telugu.

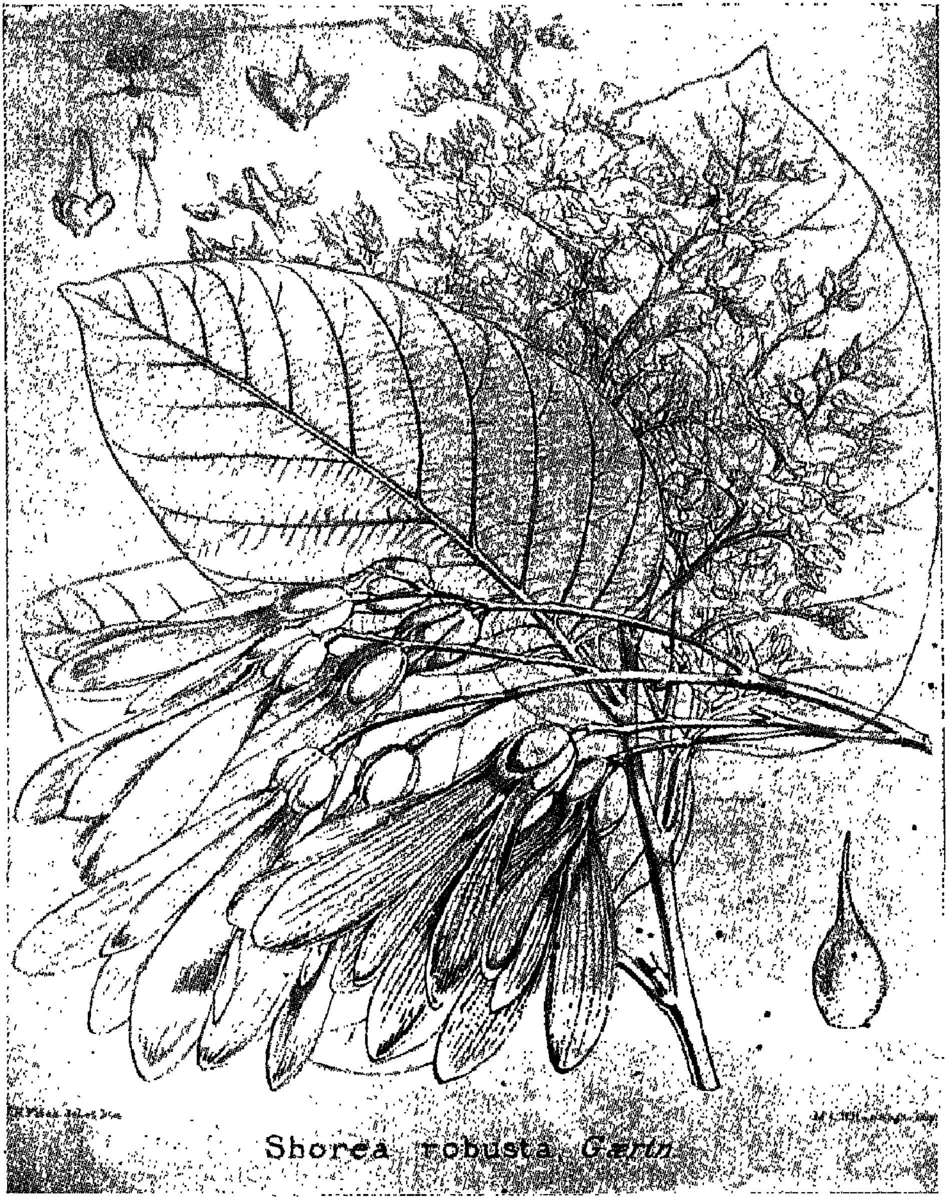


Fig. 15. Sal flowering branch and a bunch of fruits with long wings. (*Courtesy* : Walter Fitch).

wings (Fig. 15). The fruits are in great haste to sprout. Sometimes they do on the tree itself in rains. If no rain comes for a week they perish. The fruits have a fleshy kernel. It was an important food for the tribal people during the terrible famine of 1897. Nowadays they are used for the manufacture of chocolates.

Nature has been kind to sal in Bihar and parts of Madhya Pradesh and Orissa. Under old trees young ones come up sometimes as thick as weeds. All that is required is to fell the old trees when the time comes. The young crop is tended for a hundred years or even more before it becomes mature for harvesting.

In Uttar Pradesh conditions are difficult for sal. Very few seedlings appear under the old trees. Animals brouse them. Frost kills or injures them so badly that they take years to recover. The common method adopted in Uttar Pradesh is seed-tree method. Here we work with Nature and get her work with us. While harvesting a ripe sal forest, a few good healthy trees are selected and retained on each hectare. They serve as mother trees because it is from their seeds that the future plantation comes up. Should a fire kill the seedling the mother trees will provide seeds for another crop. In this way they act as an insurance against fire damage. They serve another purpose. Sal seedlings are sensitive to frost. Mother trees serve to shelter the young crop against frost. It takes many years before a full crop of seedlings appears. When the seedlings have reached an age, mother trees are not needed and are removed. This young plantation is protected against fire, weeds and cattle for some years.

In West Bengal sal plantations are formed by planting after clearing mature forests.

Timber of sal is very strong, hard and durable. It is fit for heavy and rough work. It is used for making railway sleepers, posts, piles and beams. Farmers making spokes, felloes and hub of wheels and body of carts.

7

THE INDIAN CHRISTMAS TREE

ABROAD THE CHRISTMAS tree may be a fir, a spruce, a pine or a cedar tree depending upon the place. In India south of the Himalayas where conifers are not common it is often Casuarina (Fig. 16). It looks like a Christmas tree very much on account of its conical crown.

Long stretches of sandy beach look beautiful with these conifer like trees which have a graceful feathery foliage (Fig. 18). They are part of our seaside landscape. The plantations are neat and clean. No bush or grass comes up under them. The floor is covered by their soft delicate 'needles' (Fig. 17). It could be a nice place for a picnic. But beware of ants which are always foraging. They are very fond of its seeds.

THE INDIAN CHRISTMAS TREE : *Sura,* Marathi; *Chouku, Saruku,* Telugu; *Chavukku,* Tamil.

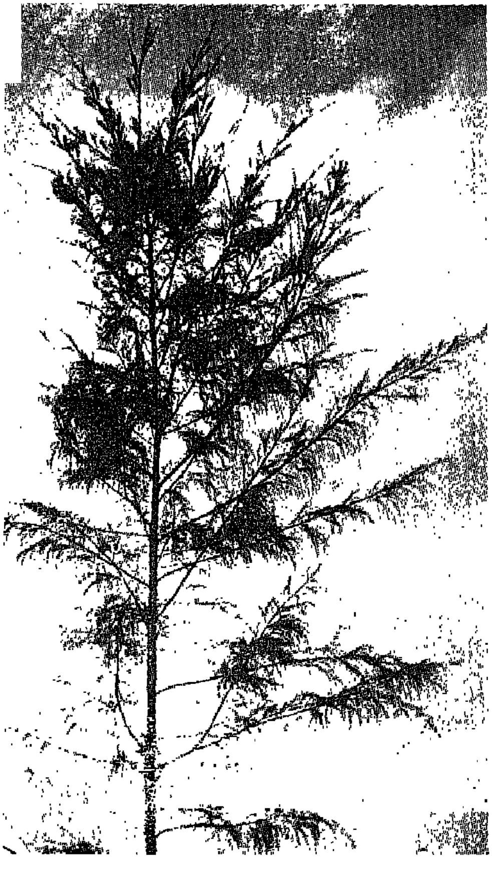


Fig. 16. Casuarina tree

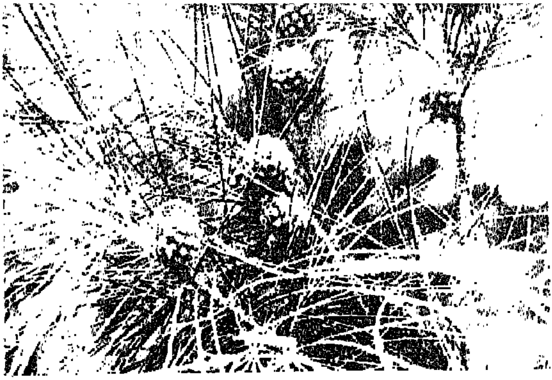


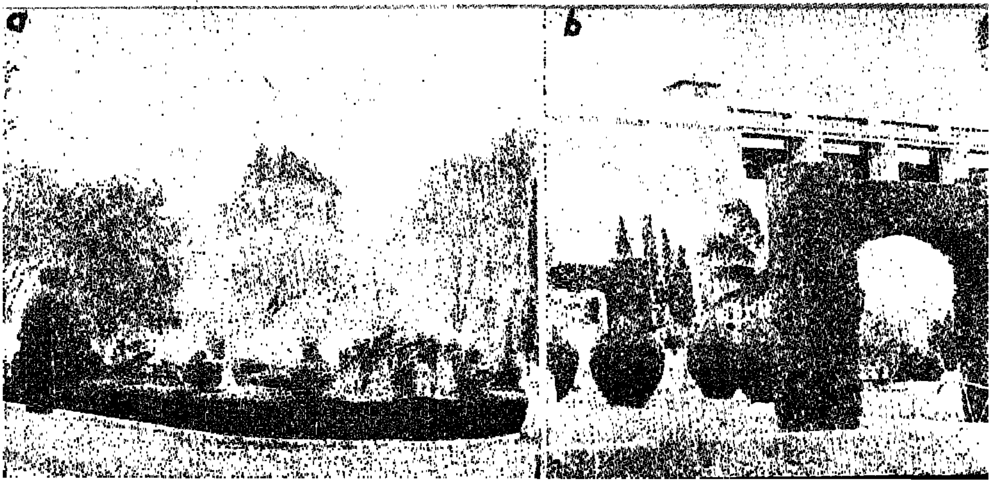
Fig. 18. 'Needles' that is how casuarina shoots are called and fruit bunches.

Fig. 17. Soft delicate needles cover the floor under casuarina trees. Bunches of fruits are also seen.

Topiary

Casuarina is a tall and straight tree but grows bushy if trimmed often. Thick casuarina hedges are very common. They are often trimmed in the shape of birds and animals in parks (Figs. 19 a & b). This is the work of skilled gardeners. The art of trimming bushes into shapes is called topiary.

Fig. 19a & b. Casuarina trimmed into hedges and various shapes in parks.



Shifting sands

In the treeless beach and river banks sand is blown off constantly. Sand-hills appear, disappear and reappear as fast as they vanish. Nothing seems to stay for long. Sometimes in the past villages and temples were buried because there was nothing to cover the sand against wind. A good casuarina plantation is the best protection for the exposed sand. The casuarina was brought from the shores of the Andamans and Burma where it grew naturally. A hundred years ago the first plantation was raised near Ullal in South Kanara. Then it spread along the coasts of the Indian Peninsula more on the East Coast. In favourable places it grows 30m high or even more. It lives for fifty years.

Plantations are raised on flat shores, low sand-hills and river banks. It is profitable to raise them and so private people grow them even on unsuitable soils. Nursery seedlings 30-50cm tall are used. After a good rain, planting work begins. The planting day is a busy day. One set of men make pits in rows 2-3m apart. Another set follows, planting the seedlings. A number of women with pots of water line up to assist

Fig. 20a. Soil is puddled by mixing it with water into a loose paste in pit.

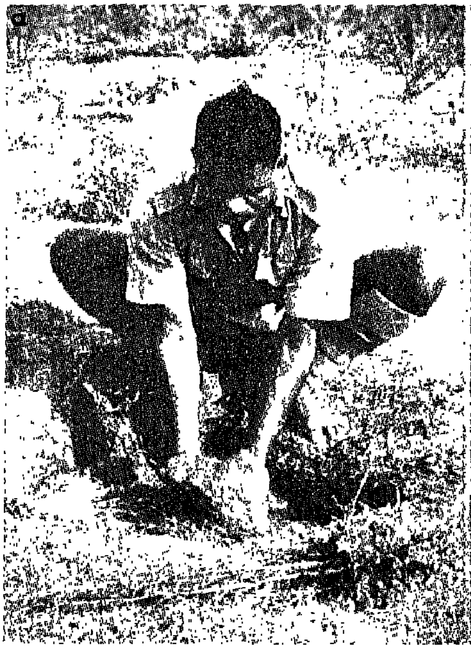
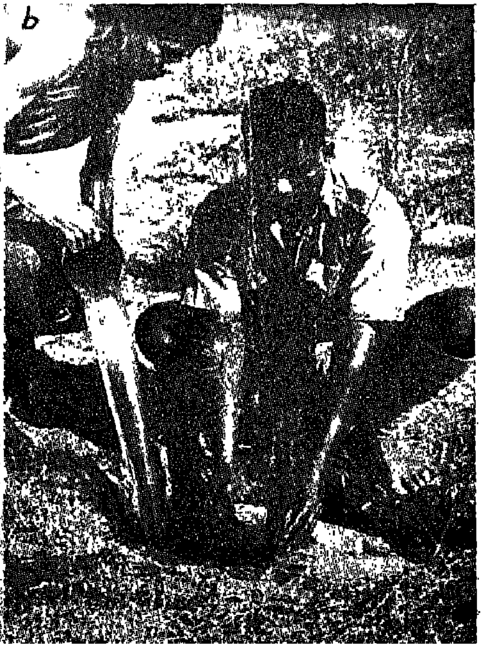


Fig. 20b. Planting of seedling.



them in planting. Water is poured into pits and the soil is mixed well into a loose paste. This is called *puddling* (Fig. 20a). The naked seedlings are placed in the pits, fresh soil shoved in, and firmly tamped (Fig. 20b). Sandy soil does not hold water for long and the seedlings are watered for a few weeks till their roots reach deeper layers.

Mysterious friendship

There is something peculiar with casuarina. Minute lumps of the size of mustard or a little bigger are seen on its roots. They are called nodules. A kind of bacteria live in the nodules. By a mysterious friendship they help the trees in finding some nourishment which the poor soil cannot afford.

Plantations are formed in Kanara districts, Tamil Nadu, Andhra Pradesh and Orissa. They are harvested when they are 8-10 years and sometimes 15 years in Kanara. Casuarina wood is mainly used as firewood. As firewood perhaps it is easily the best.

8

SHISHAM

Shisham in the battle front

SHISHAM OR SISSU is how it is called in Hindi. It is a close cousin of the much prized rosewood or blackwood common in the South. Next to teak it is the most valuable timber in Upper India. It is the favourite of furniture-makers. It is the finest wood for intricate and delicate carving. The Simla and Saharanpur carvings are well known. The wood is astonishingly strong and durable. It is commonly used for cart wheels and gun carriages. During the Afghanistan attack the British soldiers were all praise for the gun carriages fitted with shisham wheels. They served extremely well on those rugged hills and came back to India without a breakdown while the wheels made out of the choicest European wood fell to pieces within a few months of service. A pair of wheels exhibited in Paris in 1900 was much admired.

Shisham forests

It is surprising that such a valuable tree grows on poor soils naturally. It comes up in large groups often with khair on the banks of sandy or stony torrential rivers or in valleys of the Himalayas from Punjab to Assam. In Central India it is found on river beds which remain dry for most of the time. It is a medium-sized tree reaching a height of 20m and a girth of 2m. (Figs. 21 & 22)

Shisham plantations are found mixed with khair, semal and others. The common method is that the forester joins the farmer and raises the plantation. Naturally the farmer is interested in his crop. He breaks up

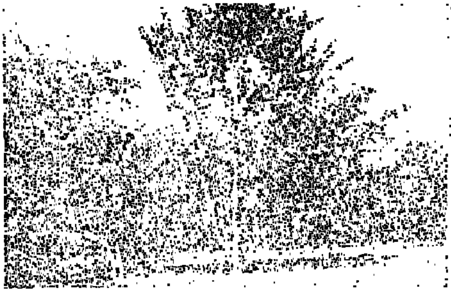


Fig. 21. A young Shisham tree.

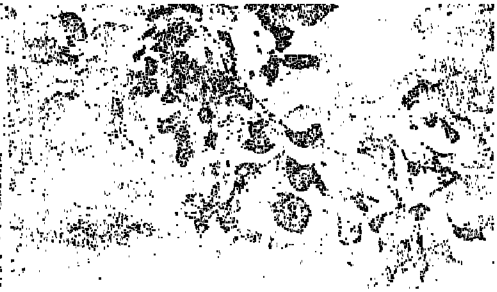
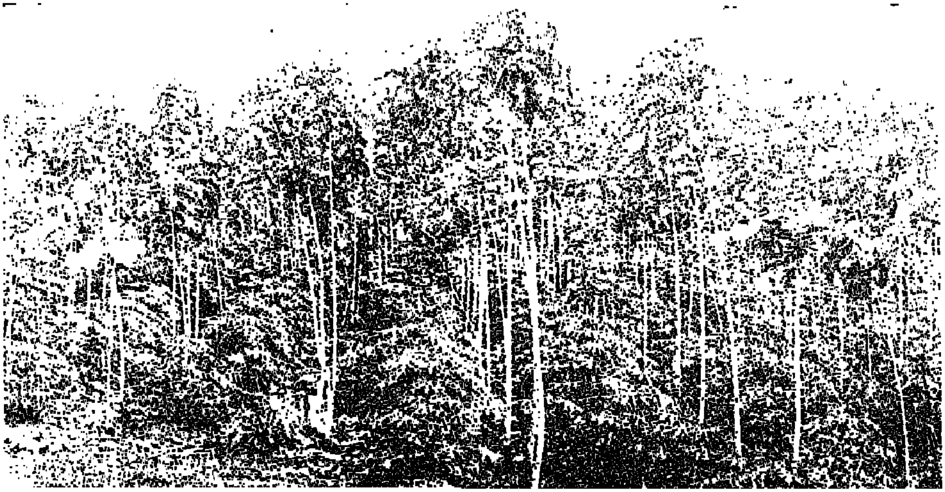


Fig. 22. Shisham foliage and fruits.

the coarse and rugged forest land and makes it a nice field. He removes all roots, stumps, stones and rubbish. He tills the soil. After sowing he carefully tends them by removing the weeds and protecting against wild animals. Suppose our plants are in the midst of his crop. They will also share all the benefits which the farmer lavishes on his crop. So what we do is to get ready with the farmer to sow or plant ours. Long low bunds or ridges at some intervals are formed across his fields and shisham seeds sown. Often too many seedlings come up. Only well grown are selected and retained. They grow much faster than those in natural forests. This method was first followed in Burma and then in Indian forests. It is known by the Burmese word *taungya*, meaning cultivation in hills. The *taungyaman* cultivates for two or three years and goes to other areas where plantations are to start. By this method plantations of other kinds teak, sal, eucalypts, softwood trees for matchwood factories, khair, cashew are raised all over the country (Fig. 23). Not only good plantations are formed but also food crops are grown over hundreds of hectares every year.

Fig. 23. Two year old teak plantation with tapioca as taungya crop.



9

THE KATHA TREE

Katha

PAN CHEWING IS a habit common in our country. People love chewing after a heavy meal or marriage feasts. *Pan* leaves are smeared with katha and taken with little lime. It produces a pleasing red colouration. It is said to cool and help digestion.

Katha is sold in bazaar as small tablets or irregular pieces of light brown colour. It has a peculiar taste described as being astringent. Sometimes it is scented. It is also used in medicines.

Katha tree is commonly known as khair. Khair forests come up naturally in large groups on the beds of rivers and streams often mixed with shisham. It is a common sight all along the foot hills of the Himalayas. It also grows scattered in dry deciduous forests. Valuable forests are in Uttar Pradesh, Madhya Pradesh and Rajasthan. There is a great demand for katha and the natural forests are not able to meet the demand. So plantations are raised in many Northern States by taungya method.

How katha is made ?

From very early times katha has been made in villages. In Gujarat and Orissa it is made mostly by a certain class of persons. Only the heartwood contains katha. Khair trees, a foot thick or even thinner, are good for making katha. The trees are felled and sawn into billets of

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KATHA : *Khair*, *Katha*, Hindi; *Kagli*, Marathi; *Shemi*, Kanarese; *Karungali*, Tamil; *Sundra*, *Tellatumma*, Telugu.

24 to 34cm. After removing the bark and sap-wood the heartwood is cut into small chips and boiled with water in earthen pots. A big hearth called bhathi is built. Many pots are placed in rows on it and heated (Fig. 24). Water in the pots slowly turns into a red decoction. This is boiled again and again till it becomes thick like syrup. The decoction is poured over sand or in bamboo containers lined with gunny cloth. Katha forms as a pink paste which is dried and cut into small tablets.

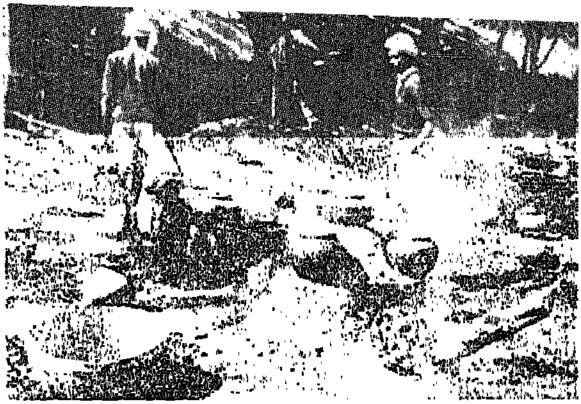


Fig. 24. Boiling of wood chips in earthen pots for Katha (*Courtesy*: The Wealth of India)

Cutch

Cutch is another product got from the heartwood. It is sold as rusty brown or dull orange-black cubes and blocks. The fishing nets and sails of ships are commonly brown in colour because they are dyed in cutch. It prevents them from rotting due to sea water and mildew. The colour lasts long. Now, cutch is largely used in printing and in the manufacture of coloured paper. There are two modern factories, one at Bareilly (U.P.) and another at Shivpuri (M.P.) producing high quality katha and cutch. There are a number of smaller factories. In India about 3000 tonnes of katha valued at 2 to 3 crores of rupees is produced every year.

Heartwood of khair is durable, hard and tough. It is used in temples and they remain in good condition for many centuries. It is not attacked by ship borers and so it is used in harbours. It is much prized for posts, rice pestles, ploughs, keels and boats, wheel hubs and tool handles.

10

WATTLE, THE TAN-BARK TREE

NEARLY 150 YEARS ago Europeans started living in the Nilgris. They liked the pleasant climate and the lovely grasslands. Being lovers of trees they brought some trees, planted the hills and made them still more beautiful. One was the wattles with the fragrant yellow blossoms and another was the tall graceful blue gum. They grow so well that they have become part of the charming landscape. How will our hills look without them is really difficult to imagine.

Fig. 25. Wattle plantation

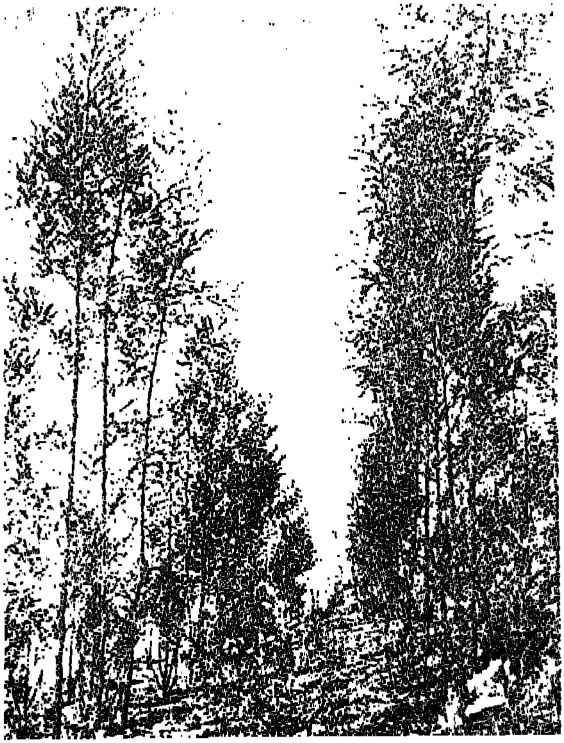


Fig. 26. Wattle seedling grown in aplastic bag.

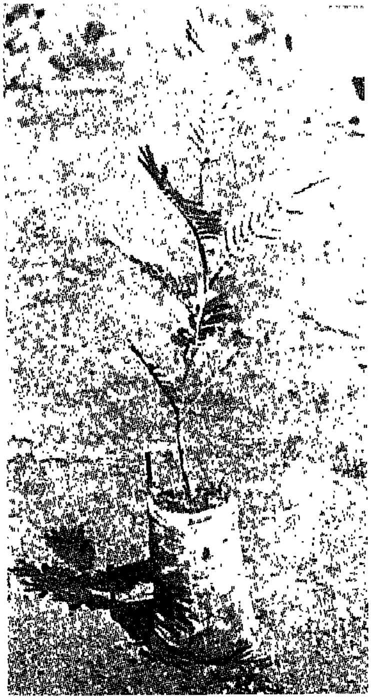
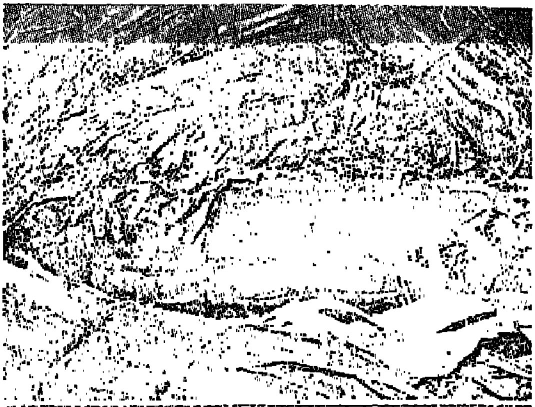


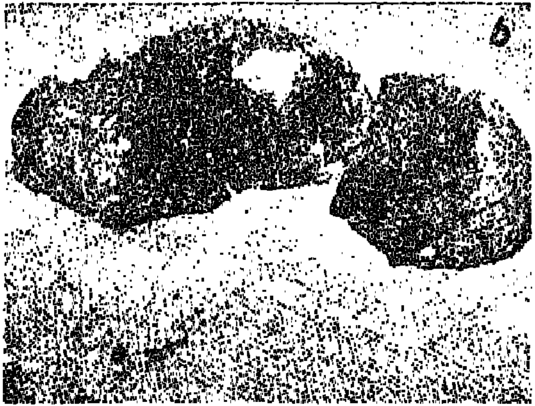
Fig. 27. Stripping of bark from a wattle tree.

For tanning leather, bark of some trees is used. This is to prevent leather from decay. Tanners found wattle bark better than babul bark which they were using before. They wanted more and more. There are three kinds of wattles. Of them black wattle is the best. It thrives in cool climate. Grasslands above 1500m receiving 1250 to 2000mm rainfall are found good. Since the Second World War wattle plantations are formed in the Nilgiris and the Palnis of Tamil Nadu. At present there are thousands of hectares. It is also grown in certain parts of Bombay State.

Plantations are made with nursery seedlings. Tender seedlings of

15cm high are planted out in pits. There will be about 900 plants in a hectare. After 9 or 10 years they are 15m high and are ready for harvest (Figs. 25 & 26). Soon after cutting down the trees, the bark of the stem is stripped (Fig. 27). The bark is dried and used in tanneries or sent to the factory where tannin is produced and sold as a black mass (Figs. 28 a, b, c). The wood is a good firewood commonly used in the hills. Now it is used for rayon manufacture.





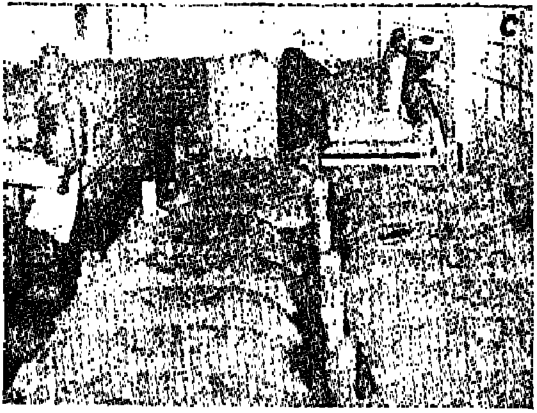


Fig. 28a. Bundles of bark.

Fig. 28b. Wattle tannin as a black glossy mass.

Fig. 28c. Wattle tannin packed in gunny bags and ready fortransport.

11

EUCALYPTUS (BLUE GUM)

What does the name Eucalyptus mean ?

IN THE year, 1770 Captain Cook sailed with a party of scientists to the Pacific Ocean on a scientific exploration. They saw new trees of many kinds as they went round the coast of Australia. They took leaves and flowers of these trees when they returned to England. Nothing was heard about them for twenty years. Then a French scientist found out something very interesting. Commonly sepals and petals sheath flower buds (Figs. 29 a & b). But eucalyptus bud has no sepals or petals. It is like a little cup with tight lid on top. Stamens and seedbox are pro-

Fig. 29a. A rose bud sheathed by sepals and petals.

Fig. 29b. Blossomed rose showing many petals.

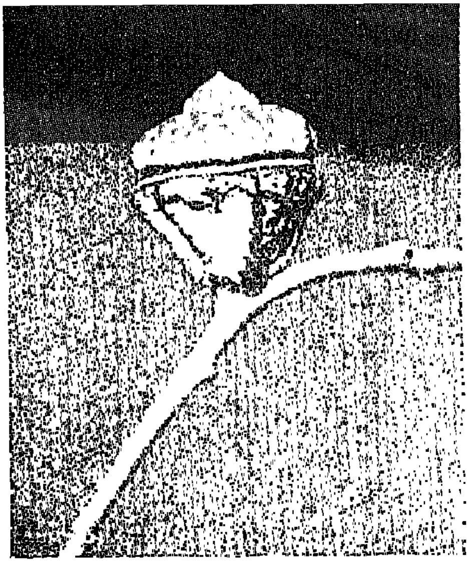


Fig. 29c. Eucalyptus bud looking like a a cup with tight lid. No sepals and petals.

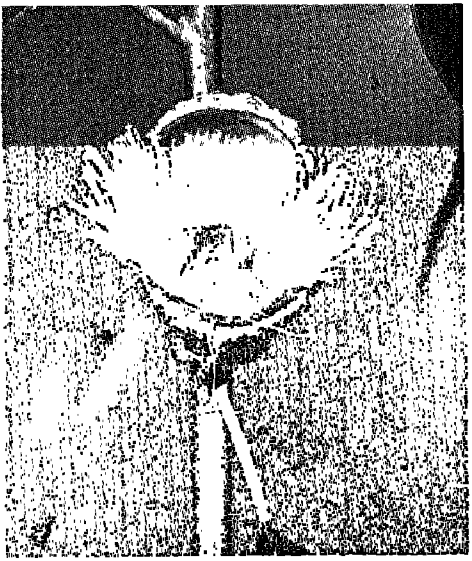


Fig. 29d. Opened Eucalyptus flower showing stamens and seed box.

tected well inside (Figs. 29 c & d). Rightly did the Frenchman name it *Eucalyptus* meaning the bud which was well protected.

Australia is the home of eucalypts where they are commonly called gums. Wherever one goes there he sees them along the coast on the snowy hills, plains, swamps and even in deserts. There are more than six hundred kinds from small bushes to gigantic trees. They are among the tallest trees in the world going over 100 metres. Many of them are good timber trees. Their leaves contain oil which can be seen as small bright spots holding them against light. Oil from some trees smells sometimes like camphor, sometimes like peppermint, sometimes like rose and sometimes like lemon. The oils are distilled from leaves and used in scents and medicines.

Blue Gum

Blue gum is a kind of Eucalyptus. It is a newcomer to India. It was first planted in 1843 for firewood and cheap timber in the hills of South India. The oldest plantation is in the Nilgiris. Blue gum grows faster than any of our trees in the hills so it is highly favoured. It grows well in the Nilgiris and in the Palnis above 1500 m. It is also planted in the Simla Hills and in Assam. Like wattle it is planted in the extensive grasslands of the Southern Hills (Fig. 30).

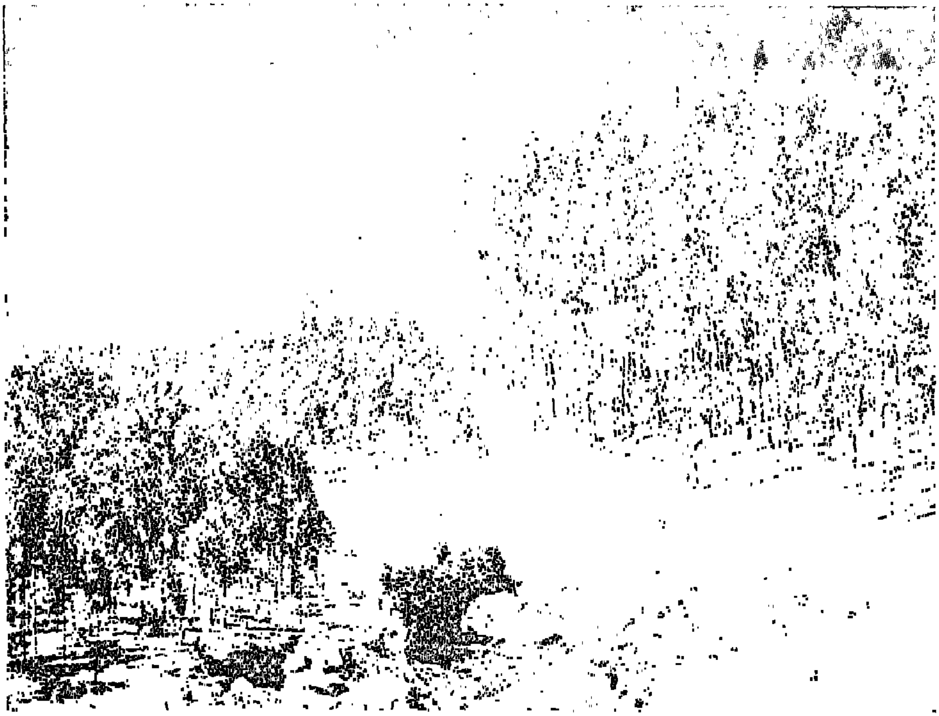


Fig. 30. Eucalyptus plantations in grasslands. The plantation on the right is the older of the two.

Seedlings from the nursery (Fig. 31) when they are 20cm high are planted during the July rains spaced at 3m. A dose of fertilizer is given to each plant at the time of planting. During summer fire is common in the grasslands and the plantations are carefully protected.

How to grow a plantation in the place of an old plantation ?

When we cut trees we do it a little above the ground level. The projecting remnant of the trunk is called *Stool.* Although the tree is cut down the root is living. Within a few weeks leafy shoots sprout on the

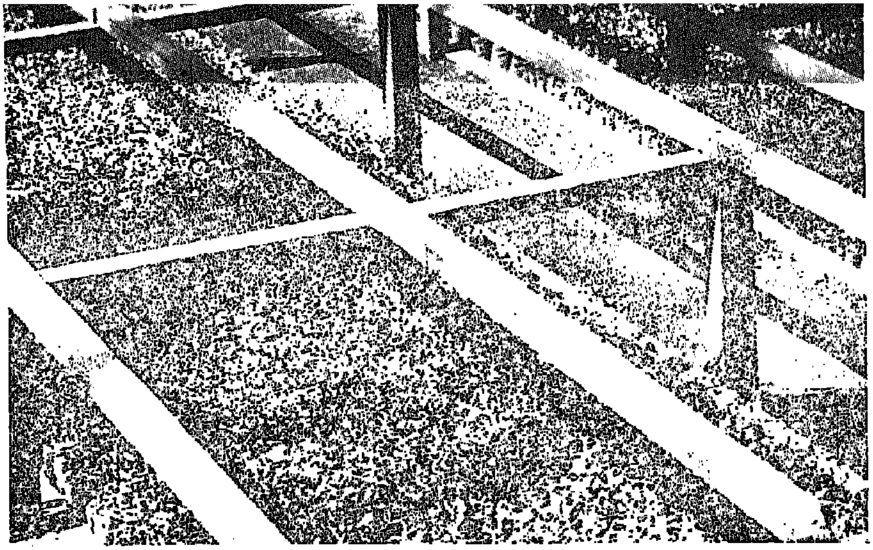


Fig. 31. Eucalyptus nursery seedlings growing in plastic bags. The wooden frame is to support shelter for the tender seedlings.

stool. They grow fat as they are nourished by the root of the parent tree. The shoots grow up into stems in a short time. Teak, sal, shisham also sprout extremely well while conifers do not. This method is known as *Sprout Method* (Fig. 32).

So there is no need to plant at the same place. The stools of blue gum are vigorous and each one of them puts forth many or sometimes even twenty shoots. Most of them perish except two or three. In fifteen years time they grow up and are ready for harvest. We go back to the plantation after fifteen years and again to the same plantation after thirty years. We cut the same stool for the third time and harvest

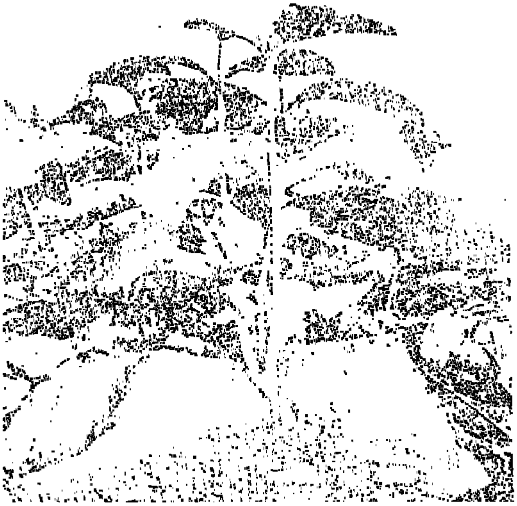


Fig. 32. Leafy shoots sprouting from teak stool.

four crops. Then the time comes to replant the land because the parent root has become too old.

Although it was planted for firewood it is in great demand for the manufacture of rayon. The famous *Eucalyptus* oil is distilled from the leaves.

Other gums. There are other gums like the rose gum and Mysore gum which grow in places where blue gum cannot come up. Rose gum plantation over thousands of hectares on the low hills of Kerala are grown. Mysore gum (Figs. 33 and 34) is even better. It comes up under wide conditions of rainfall and elevations. Plantations are raised in Tamil Nadu and Karnataka States in places of low and heavy rainfalls

Fig. 33. One year old Mysore gum.

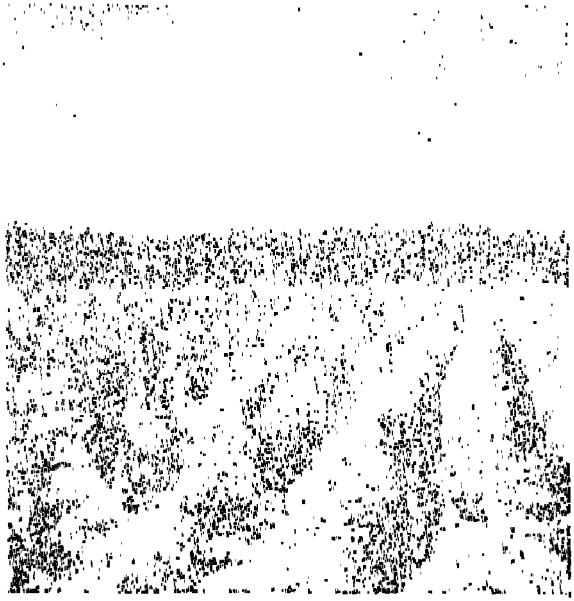


Fig. 34. Mysore gum plantations, one year old in the foreground and older one in the background.

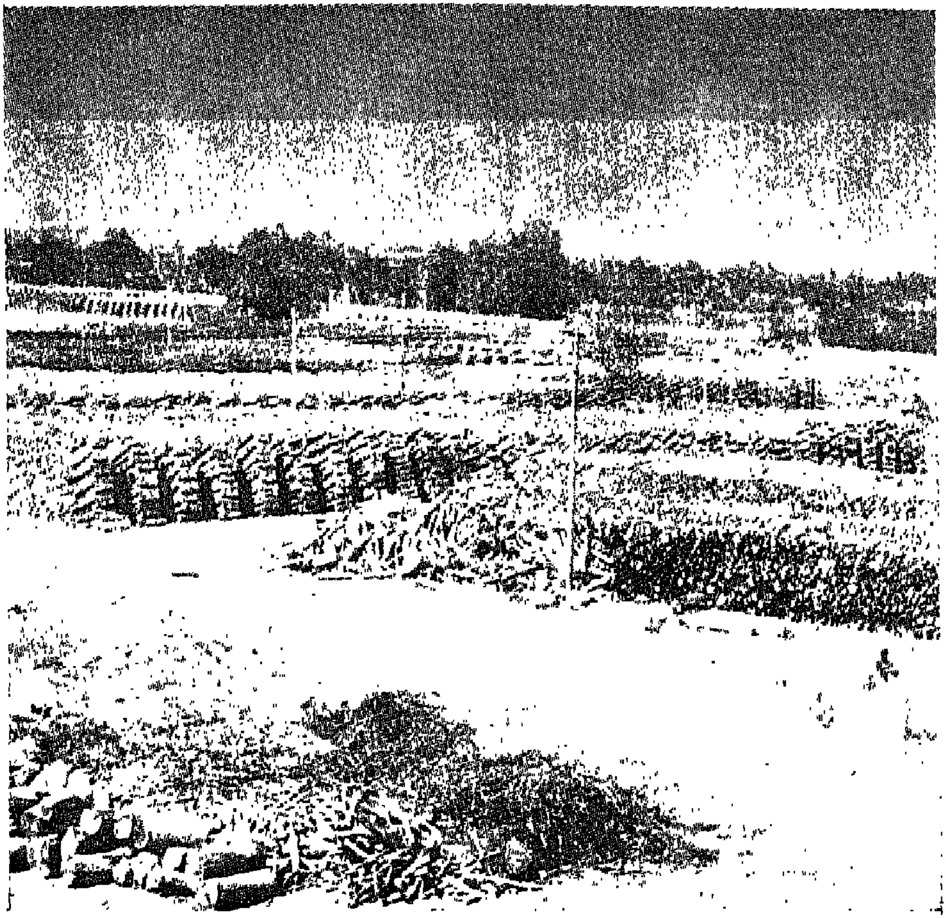


Fig. 35. Blue gum wood stacked in the yard of a rayon factory.

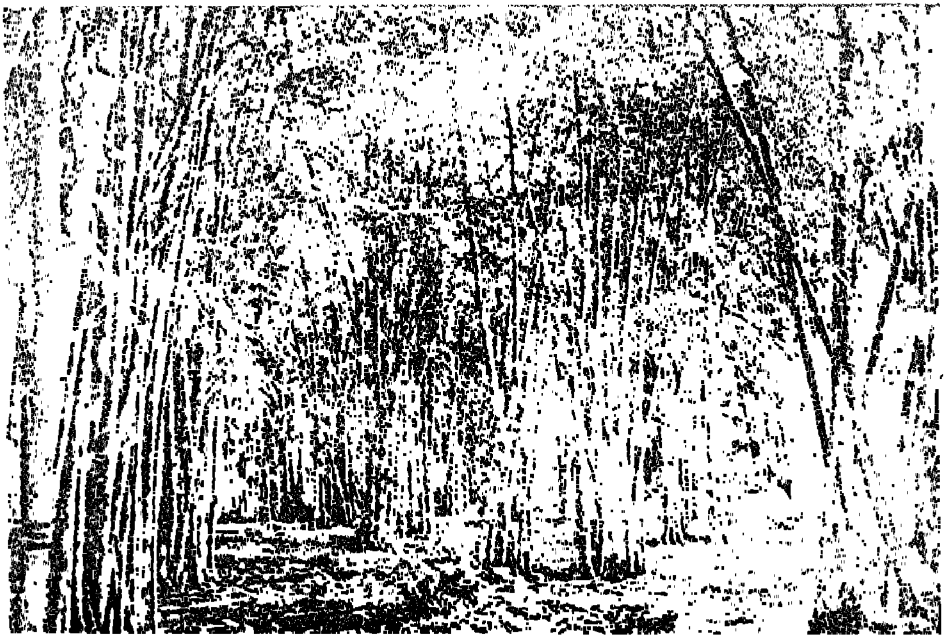
from sea level to high up in the hills. The wood of these two gums (Fig. 35) are also used for the manufacture of rayon.

12

BAMBOO, THE POOR MAN'S TIMBER

BAMBOOS ARE interesting. Although tall and big they are just a kind of grass. They reach a height of 30 to 40m. The stem is hollow except at the nodes giving a jointed appearance. They grow in large family groups called clumps. Every year a few young stems (culms) are born in the family. The young stem grows to its full height in about four months, nearly 20cm in a day. There is no tree which grows as fast as bamboo. In a few years young and old culms crowd the clump (Fig. 36).

Fig. 36. Bamboo plantation. Bamboo grows in groups called clumps. (*Courtesy* : Natural Resources Planning Commission)



Bamboo flowering and famine

Trees flower every year but bamooos once in their life, say after thirty, forty or some time sixty years. As if it is a general order all stems in all groups arrange to flower at the same time. It is indeed a wonderful sight to find hundreds of flowering stems smoothly and lightly moving in air like mighty feathers of forest. After fruiting all culms die. Soon the ground is covered with pale yellow grains of bamboo. It is time that jungle fowls, monkeys and rats arrive in hundreds, attracted by the grains. Poor people also collect the grains and cook them for food. There is a saying that famine follows bamboo flowering. It is true in a way. When food is plenty animals especially rats increase in number. After finishing bamboo grains they turn to fields. The farmer loses lot of his crop and this causes famine.

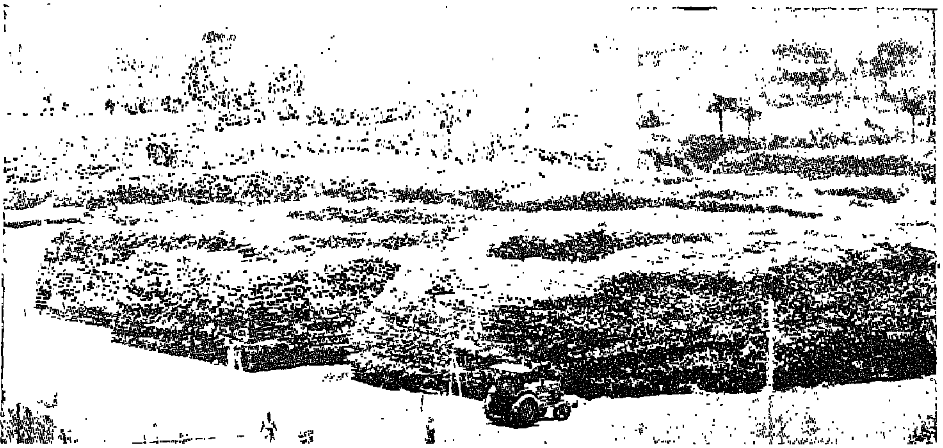
Poor man's timber

Over a hundred kinds of bamboos grow in our forests. Two of them are important and common. Bamboo serves the poor man in so many ways. It is used for making huts, rafters, mats, bows and arrows, basketry, water pipes, musical instruments and so on. Young shoots are pickled in Coorg.

Bamboo and paper

Today its most important use is in the manufacture of paper (Fig. 37). Bamboo pulp makes high quality paper. Inferior wood pulp

Fig. 37. Stacks of bamboo in a paper factory.



is used by mixing it with bamboo pulp and superior paper is made. So there is a great demand for bamboo. Bamboos grow naturally in teak forests and mixed forests throughout our country. They meet the great demand from paper factories. Large bamboo plantations have also been raised in Tamil Nadu and other states.

Bamboo plantations

A few clumps of bamboos will be able to meet the needs of the villager. If he wants another clump all that he does is to remove a part from the mother clump and plant it at some distance from the mother clump. In six to eight years a big clump will form.

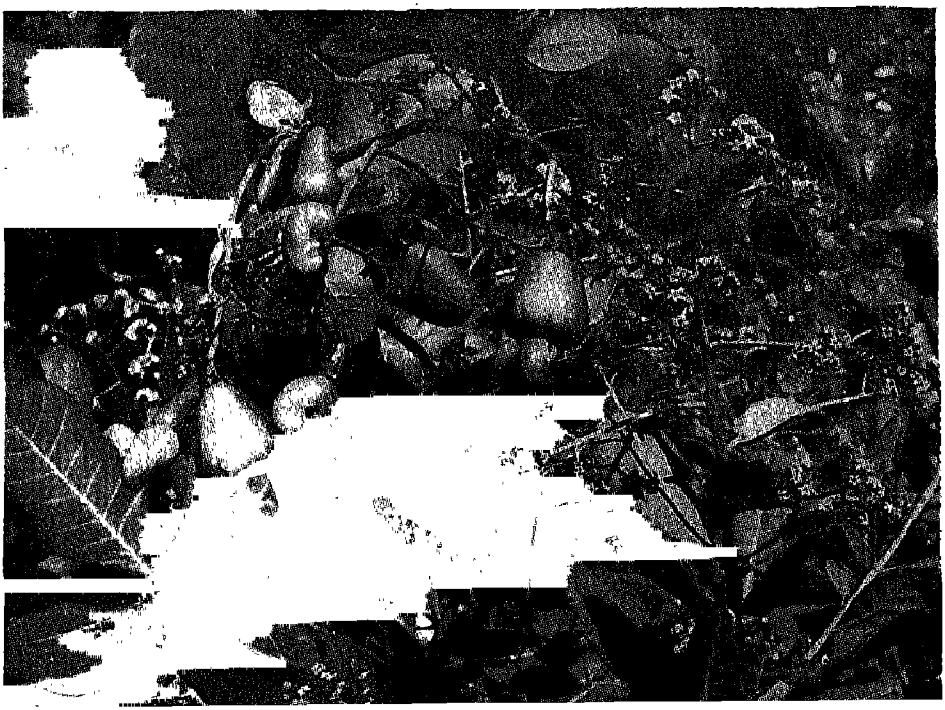
Big plantations cannot be formed in this way. Bamboo seedlings are needed. For this we should know where bamboos have fruited. Bamboo grains are obtained from those places and seedlings raised in the nursery. They look like paddy or wheat seedlings in the early stages. They grow for a year or two when they form their little clumps. During rains the clumps are planted in the forests 7m apart. They are tended well. In about eight years there will be many big clumps in each group. Every time we take only a few and go back to the same clump after two years. Rest for two years make the clumps to produce new stems.

13

QUEER LOOKING CASHEW

THE CASHEW fruit is queer looking! It looks as if the seed is sticking out of the fruit. What appears like a seed is really the fruit at the end of the swollen juicy fruit stalk called cashew 'apple' (Fig. 38). Cashew has become valuable because of the kernels. You have to crack the hard nut to get them. They are eaten raw or roasted, salted or sugared. They are a popular dessert in the U. S. A. and are used in the manufacture of

Fig. 38. Cashew fruits and flowers.



chocolates. The hard nutshells give an oil when roasted. The oil is used for making gums, inks, paints, varnishes and for preserving fishing nets, etc. The wood is a cheap fuel but is now used in the manufacture of hardboards.

Cashew and the Portuguese

No one knew all about this when the Portuguese brought it to our country from South America some four hundred years ago. On the West Coast where they settled they were bothered about the sand blowing all over during strong winds. They wanted to keep down the sand by growing something. Cashew came handy and they planted it on the beach.

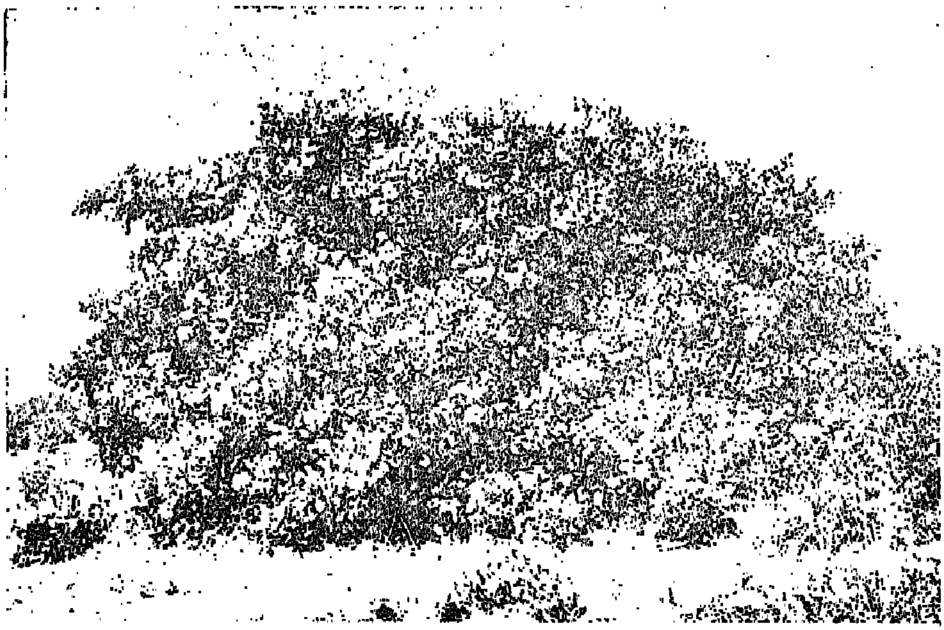


Fig. 39. Cashew tree in fruits.

Peculiar tree

Cashew on the East Coast is peculiar. Commonly trees have a distinct trunk and head called crown. Cashew looks as if it is all crown and no trunk at all (Fig. 39). The trunk starts branching very near the ground.

The branches lying on the ground strike roots and do not depend upon the main root. In November-December it flowers and the entire neighbourhood is filled with fragrance. Swarms of bees are active. Fruits ripen in summer. At this time the cashew tree is a picture of beauty with its bright red and yellow 'apples' on it. Crows and parrots have a busy time. Cattle are fond of these fruits and eagerly wait for them to drop from the tree.

Cashew is grown commonly in North and South Kanara districts, Kerala, Tamil Nadu and in parts of Andhra Pradesh and Orissa. It comes up in sandy soil and also on hard laterites of the West Coast and under rainfall from 1000 mm. to 3000 mm Private people grow it in small orchards.

The agriculturist raises food crops like paddy, wheat and millets. The horticulturist grows orchards of fruit trees. The forester raises plantations to produce wood. Growing fruit trees is new to him. He has not done this before. However he ventured into this field and started growing cashew in forest a few years ago. The result is that Tamil Nadu Forest Department has raised 15,000 hectare of plantations in the poor scrub forests commencing from the year 1956. This is followed by other State Departments.

In a good orchard a hundred trees grow in a hectare. We see no other tree or even scrub. Trees are wide apart with enough room all round. The soil between the trees is ploughed and manured. It would cost a lot of money to remove the entire scrub and make the forest land as good as that of farmer's. So the scrub jungle is cleared only in long strips 3 to 6m wide. The strips are 10m apart. Rain is meagre and uncertain in Tamil Nadu where cashew is cultivated. The simple pit commonly made for sowing is not enough. Something more needs to be done. The ground surrounding each pit is scrapped in such a manner that the whole thing looks like a shallow saucer with the pit in the centre (Fig. 40). All the rain that falls in the saucer flows into the pit. A light drizzle brings the effect of a good rain at the pits. After a good soaking rain one or two nuts are sown in each pit. In two or three weeks seedlings appear on the ground. The plants are carefully tended. They commence fruiting

Fig. 40. Ground dressed in the form of a saucer with the pit in the centre.

in the third or fourth year. They come to full bearing at the tenth year. They live for forty to fifty years. Good plantations are raised with the help of taungyaman.

Cashew plantations need tending like ploughing, manuring and protection against pests very often. They cannot be treated like teak or sal plantations. The more we tend them the better is the yield of nuts.

14

BOUNCING BALLS

NATIVES OF the New World were the first to play with balls that bounced. Colombus wondered when he saw them in Mexico. He was told that they were made of the juice of some wild trees. The bouncing ball was a novelty in Europe at that time. A viceroy took a batch of ball players with him all the way from Mexico and amused the Spanish king. During the reign of Queen Victoria the interest of a few Englishmen was kindled. Some already knew a kind of rubber tree growing in the dense and perilous jungles of Amazan. At that time a young dashing man, Henry Wickham, set out to the jungle to seek his fortune in rubber. At the same time a famous botanist, Sir Joesph Hooker was toying with the idea of growing rubber plantations in India and the East Indies. He requested Wickham to get him some seeds. In 1876, seventy thousand seeds reached England after a great deal of difficulty. That is an interesting story by itself. Of the seedlings 2,000 were sent out to the Botanical Gardens in Ceylon and Malaya. These were the mother trees for many of the plantations in Sumatra, Singapore, Borneo and Burma.

Rubber plantations in India

In India, for the first time in 1905, plantations were grown in Kerala. Extensive plantations occur in Kottayam and Quilon districts, and in the adjoining Kanyakumari district of Tamil Nadu. Rubber

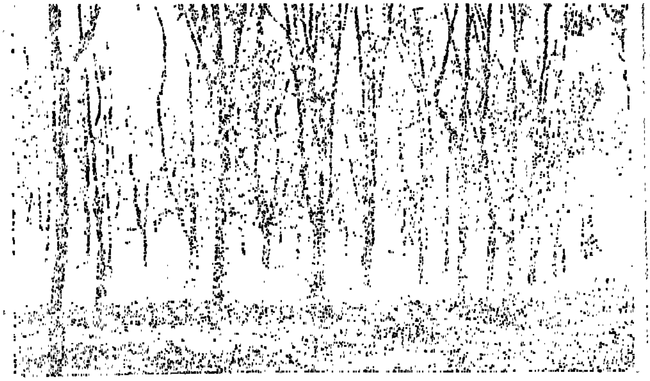


Fig. 41a. Rubber plantation.

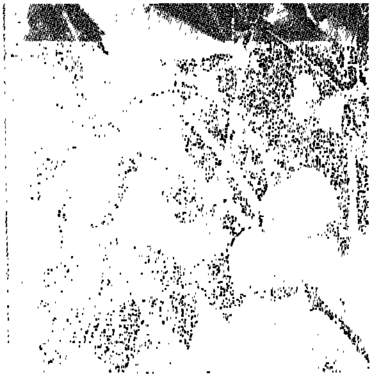


Fig. 41b. Rubber leaves and fruits.

plantations are grown in Coorg, the Andamans and also in Assam and Bengal.

The rubber tree grows well if the climate is warm and humid and if there is rain every month. The lower slopes of the Western Ghats not above 300m are excellent and here one comes across extensive rubber plantations (Fig. 41).

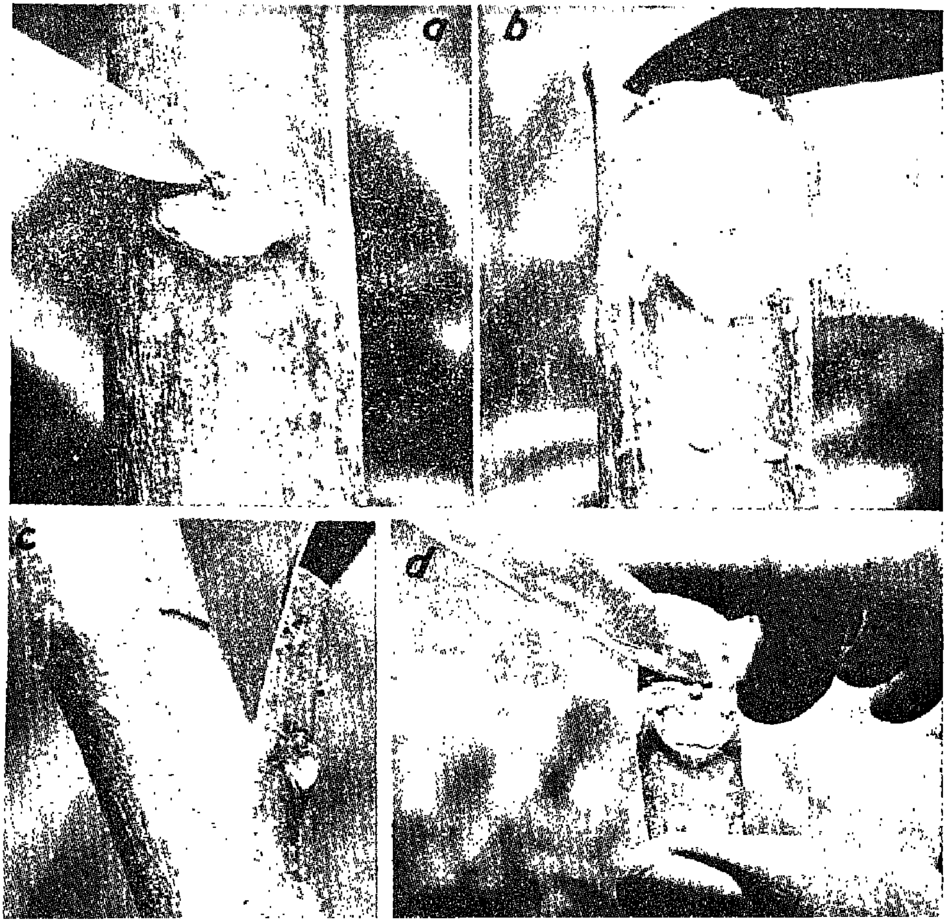
Before planting the jungle is cleared, trees felled, stumps uprooted and bushes cleared. The unwanted rubbish is burnt. The sloping ground is dressed into a number of narrow terraces. They appear like a series of long winding steps from a distance (Fig. 42). Drains are made for the rain water to escape. Big pits 1m square and 1m deep are dug and refilled with good soil. The distance between the pits is 6m. There will be 280 trees per hectare.

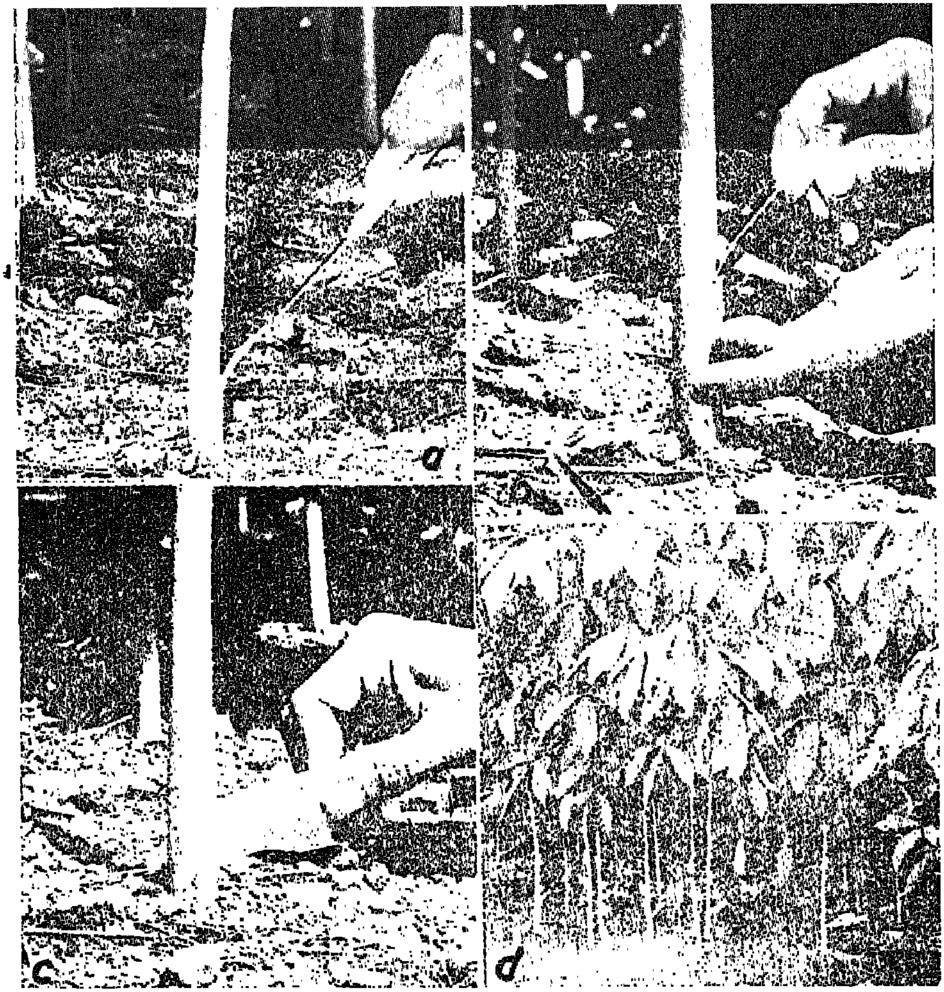
Fig. 42. A cleared hill slope cut into a flight of terraces for planting.

What is a bud-graft tree ?

Six months before planting seeds are sown in beds. The seedlings are carefully removed from bed and planted in forests in rains. This was the practice some 50 years ago. When the seedlings grew up all of them did not make good trees, some yielded more latex, some less. The planter wants only good trees in his estate. He had an idea. He carefully removed the buds from the good trees by a sharp knife and tied

Fig. 43. (a) Knife points to a bud to be grafted. (b) Bark is incised on four sides latex coming out. (c) Bark with a bud is being peeled. (d) Piece of bark with the bud after removing from the stem.





(a) Bark is slit from a rubber seedling.
(b & c) Bud inserted in the slit and wrapped up by a plastic film.
(d) Grafted seedlings in nursery.

them on the seedlings after slitting the bark. The bud grafted with the seedling in a few weeks (Figs. 43 & 44).

The seedling is cut a little above grafting so that the future trees develop from the grafted bud. Here the root of one plant and the shoot of another are joined up. This is called a bud-graft tree. Thousands

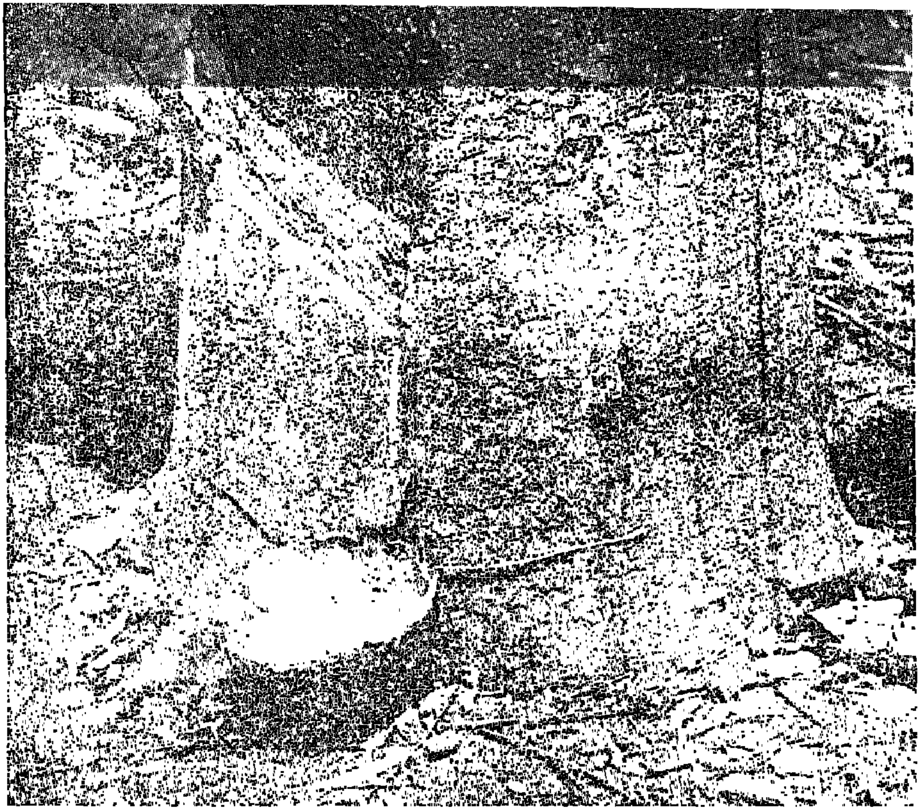


Fig. 45. (a) Tapping of rubber tree for latex.

of such bud-grafts are raised in the nursery and planted out during the rainy season. Trees grown from seedlings used to give 760 to 850 kilograms of latex per hectare. Bud-graft trees give nearly 2 to 3 times of what the seedling trees give.

After clearing and burning the ground is bare. Soil will be washed off during the rains. Low herbs are grown as a cover to the soil. They also make the soil more fertile. Additional nourishment is given to the planted young ones by adding fertilizers.

Rubber trees suffer from some diseases due to fungi. It is a common sight to see small aeroplanes and helicopters spraying fungicides for killing them.

How to get latex ?

The rubber tree is valuable for the milky white fluid (latex) it has inits bark. When leaves are plucked or the bark is scratched white latex

45. (b) Rubber latex becoming tacky after a few seconds.

comes out. How to get it without killing the tree? It is a skilful operation. It starts when the trees are seven or eight years old. A sharp fine cut is made into the bark and a paper thin slice (1mm) of bark is removed. Latex flows out quickly then slowly and curdles after sometime (Fig. 45a). The cut is half way round the trunk and is slanting. The latex flows down into a cup through a spout. Halves of coconut shells are used as cups in South India. This method of collecting latex is called tapping. Before the trees are tapped again coagulated latex is removed and another thin slice of bark is cut. Tapping is done on one half of the trunk for 60 to 80 months on every alternate day. Fresh bark grows over the injured stem slowly as wound on our body heals up. If the cut is too deep, the wound does not heal up properly and the new bark will not be smooth. After reaching the ground level tapping starts on the other side of the trunk. It takes nearly the same time. By the time it is over the other side is ready for tapping. In this manner rubber trees can be tapped for 40 to 50 years. Tappers are busy in the morning because the flow of latex is vigorous. They tap 200 to 300 trees in three hours. The forest Department of Tamil Nadu raised the first plantation in 1962. It manages 6000 hectare of plantations and a rubber factory. In Kerala and Karnataka States there are Government owned plantations.

Rubber is used for making nearly 55,000 products used in our homes, industries and services. Tyres and tubes use up most of the rubber produced. Out of the rest boots, shoes, soles, heels, balls, toys, ballons, sports goods, erasers, sponge rubber in cushioning, seating, bedding are made.

15

HIMALAYAN CONIFERS

THE NEEDLE-LEAVED trees are called conifers. They do not bear flowers like the broad-leaved ones. Instead they produce cones—pollen cones and ovule cones—sometimes on distinct trees. When the cones are ripe on the tree a strong wind will bring down a shower of golden pollen dust. They produce a lot of pollen. After pollination cones take a long time, a year or even longer, to form seeds. Their leaves and wood contain a pleasant smelling oil which becomes brittle solid when exposed to air.

Coniferous forests are widely distributed particularly in the cool northern and southern parts of the world. They grow on high hills in the warmer parts also. More than $\frac{3}{4}$th of the world supply of timber comes from these forests. In India there is very little of this kind, only 3 per cent of our forests have conifers, the rest are broad-leaved forests.

Much of our valuable coniferous forests grow in the Western Himalayas in the States of Jammu and Kashmir, Punjab, Himachal Pradesh and Uttar Pradesh. Assam and Bengal too have some forests. The important Indian conifers are deodar, chirpine, blue pine, spruce and silver fir. Although they grow mixed to some extent every one of this group has a zone where it is most common. Chirpine is found on warm lower slopes of 900 to 1500m. In Uttar Pradesh and Jammu & Kashmir extensive pure forests occur. Spruce and fir love cool heights and slopes and grow above 2500m and go up to even 3350m. Deodar grows between these zones (1500-2400m) mixed with blue pine.

Deodar

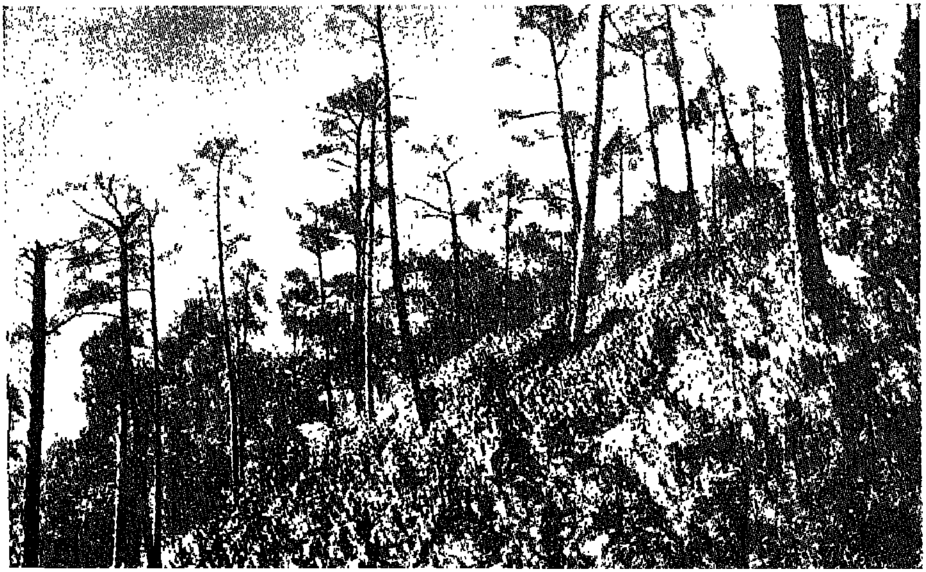
It is a large graceful tree with silvery blue needles. It is one of the very few Indian trees growing more than 70m high. Such fine trees are seen even today in temple groves where they are well protected. They grow slowly and take 150 years to reach a size of 75 cm in diameter. On poor soils it may take more than two centuries before they are ready for harvest. Natural deodar forests grow where rainfall is 1000 to 1750mm and snowfall heavy. They are managed under the Seed Tree Method explained in the chapter 'Grand Old Sal'. Plantations are also formed by sowing and planting nursery seedlings.

Deodar is the most valuable conifer timber tree in the Himalayas. The wood is strongly scented and durable. It is commonly used in buildings, furniture, railway sleepers. Its wood is good for making pencils.

Chirpine

It also grows to a huge size reaching 50 to 60m height. Chir forests are raised like deodar. Seeds fall in April-June before monsoons from the few mother trees retained. New seedlings appear within a few days of good rain (Fig 46). As they grow up the mother trees are removed.

Fig. 46. Seed Tree Method. Naturally growing chir seedlings under mother trees. (*Courtesy* : Gleadow)



Careful tending and protection against fire and weeds make them grow to a good plantation in 120-150 years.

Next to deodar Chirpine is the most important. The wood is mainly used for building furniture and packing cases.

Chirpine is the main resin tree of India. It is obtained from the tree by making a notch on the trunk a few cm above the ground. Resin drains along the notch into a cup or pot. Resin tapping is an important industry in Uttar Pradesh and Punjab, Himachal Pradesh and Jammu & Kashmir. Resin is distilled in factories into rosin and turpentine. Rosin is used in the manufacture of paper, soap and paints. Turpentine is required for the preparation of varnishes and paints.

Spruce and silver fir

Most of the spruce and silver fir is found in Punjab and Jammu & Kashmir. They commonly grow on remote and steep slopes. Their wood fibres are long and good as a pulp wood. But it costs lot of money to bring them down from the distant and difficult places where they grow. So they are not used for this purpose. The wood is used for pack-cases, tea-chests, planks, etc.

16

SOME COMMON USEFUL TREES

Babul

(*Kikar,* Punjabi; *Jali,* Kanarese; *Nallatumma,* Telugu; *Karuvelam,* Tamil)

The Babul is a native of drier parts of North India. It commonly grows in tank beds, rice field bunds in South India. It is a very useful tree to the farmer. Wood used for making ploughs, cart wheels, tool handles and as firewood. Thorny boughs useful for making fence. Goats feed on fruits and the seeds that pass undigested and germinate better. In the past used as fuel for steamers going up the Sind river and railways.

Bijasal

(*Bija,* Hindi; *Bibla,* Marathi; *Honne,* Kanarese; *Yegi, Peddagi,* Telugu *Vengai,* Tamil)

Common in the Peninsula. A large tree reaching 30m height and 2.5m girth. Trees give out blood red gum. Wood used for buildings, carts, wheels, boats, etc.

Haldu

(*Heddi,* Marathi; *Yettagal,* Kanarese; *Manjakadambu,* Tamil and Malayalam)

A large tree common in our deciduous forests. Seeds minute and 11,000 of them weigh one gramme. Wood is of yellow colour. Used for making furniture, slate and picture frames, cheap toys, wood carvings, bobbins.

Jack

(*Kathal*, *Kathar*, Hindi; *Phannas*, Marathi; *Halasu*, Kanarese; *Panasa*, Telugu; *Pila*, *Pilavu* Tamil; *Chakka*, Malayalam)

Grows to big size in evergreen forests. Also grown for its fruit, wood bright yellow used for furniture, cabinet making, carving, etc. In Burma the robes of priests are dyed yellow with the decoction got from the wood chips.

Laurel

(*Sain*, *ain*, *saj*, Hindi; *Matti*, Kanarese; *Maddi*, *nálla maddi*, Telugu; *Karimarudu*, Tamil)

A common tree of deciduous forests with a tall, clean trunk. Wood used for buildings, carts, railway sleepers.

Mohua

(*Ippi*, Telugu; *Katu iluppai*, Tamil)

An important tree in Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh and Orissa for its fleshy petals which are eaten raw or cooked. Dried flowers made into powder mixed with flour and made into cakes. A liquor is distilled from its petals. An oil is got from its seed and is used for burning, cooking and in soap making.

Rosewood or blackwood

(*Sitsal*, Bengali; *Shisham*, Marathi; *Biti*, Kanarese; *Jitengi*, Telugu; *Itti*, Malayalam; *Thothagathi*, Tamil)

Rosewood is a large deciduous tree somewhat looks like *Shisham*. Wood is strong and ornamental. Used for furniture, panelling, carving. Exported as blackwood or rosewood. A cubic metre of wood costs more than Rs. 10,000/-.

Sandalwood

(*Chandan*, *Chandal*, *Sandal*, Hindi; *Gandha*, Kanarese; *Suket*, Gujarati; *Chandanam*, Telugu; *Santhanam*, *Srigandam*, Tamil)

Mostly found in scrub forests of Mysore, Coorg and parts of Tamil Nadu. Grows 10 to 13m in height. Only the heartwood is scented and not the sap-wood or bark or leaves. Wood used for carving and distilled for sandal oil. A tonne of wood costs more than Rs. 10,000/-.

Semal

(*Sayar*, Marathi; *Burla*, *Sauri*, Kanarese; *Burgha*, Telugu; *Illavu*, Tamil)

A very large deciduous tree growing to 40m in height and 3 to 4m in girth. Trunk cylindrical with horizontal branches. In summer it is leafless with crimson red flowers attracting a lot of birds for pollination. Wood soft and light. Most important matchwood tree of India. The fruits give floss useful for stuffing pillows and mattresses.

Red Sanders

(*Yerra chandanam*, Telugu; *Chandanamaram*, Tamil)

Grows naturally over a small area in the Peninsula mainly Cuddappa and Kurnool districts and also Chittoor and Nellore districts of Andhra Pradesh. Also grows in certain parts of Tamil Nadu. Wood dark red or black. Useful for carving toys, ornamental house posts, musical instruments. A particular type of wood is in great demand in Japan.

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